

Photogravure

John Andrew P. Smith

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THE BEACON OF PROGRESS

In the last number of the REVIEW (page 257) it was stated that the Paris Salon of 1900 had awarded the first medal, in the Department of Architecture, to Mr. Desiré Despradelle, Rotch Professor of Architectural Design in the Massachusetts Institute of Technology, for a monument fifteen hundred feet high, to be called "The Beacon of Progress." Since then the French government has purchased two of the smaller drawings for this monument, to be hung permanently in the National Gallery of the Luxembourg. This is a rare honor, only a few architects — among them Dubon, Labrouste, Viollet-le-Duc, and Paulet — having been thus distinguished. The REVIEW is fortunate in being able to reproduce this remarkable design, in regard to which Professor Despradelle writes as follows:—

When visiting the United States for the first time in 1893, I proceeded directly to Chicago, where I was struck by the splendor of the Exposition as well as by the marvellous energy of a people capable not only of developing material things to a superlative degree, but of an artistic manifestation of such a high order. The Universal Exposition at Chicago was not alone the first great attempt of the kind in the United States: it at the same time

showed to the Old World the aspirations of a people capable of the most daring enterprise, yet paying the utmost deference to outward beauty as the setting and ornament of civilization.

The impression of the happy effect of the White City so boldly erected on the shores of Lake Michigan haunted me. It seemed that such a manifestation should not pass without leaving some trace, and the idea of commemorating this noble initiative was born. I immediately began the study of a monument as a memorial of the Chicago Exposition. This, after some months, resolved itself into the expression of a still more comprehensive thought, one of a national character, both to fix the memory of the vanished White City and to glorify a great people. All the forces which have shaped the American nation marshalled themselves in the form of a glorious monument, the symbol of progress and grandeur. The history of Rome was inscribed upon Trajan's column: that of America should be written at the base of a column fifteen hundred feet in height, of a "Beacon of Progress," a monument typifying the apotheosis of American civilization, to be erected on the site of the World's Fair at Chicago.

The studies for this gigantic undertaking, covering a period of six years, were developed in Boston and Paris. The relative scale and environment of space were first considered in determining the proportions of the monument. This done, it was no easy task to combine the decorative elements of architecture with a colossal pyramid of such proportions; to avoid the brutality of so formidable a mass of stone in order to arrive at a result so happy that the unanimous verdict of the jury of the Salon of 1900, which awarded it the first medal in the section of architecture, should be that "it is at once noble and graceful, and the thought of glorification is clearly expressed."

All civilizations of the past have their monuments, their national manifestations, whether of religious faith or of conquests, in imperishable stone,—pyramids, temples, towers, triumphal arches, columns, and cathedrals. To America at the dawn of the twentieth century is dedicated the “Beacon of Progress,” a sort of glorious Pantheon offered as a gracious gift by a passing generation to the generations to come.

The monument is supposed to be placed on Jackson Park, the site of the World's Fair, facing Lake Michigan. It is to be connected with the principal roads and avenues of the park, the chief access being from the lakeside by a maritime boulevard. A sort of esplanade precedes the access to the principal terraces and platforms, from which can be read the different facts in American history, represented by sculptures in groups of statuary, bas-relief, etching, lettering, names of eminent men who have made the nation strong and great, a triumphal *cortège* of industries, science, arts, commerce, etc.,—in short, sculptured trophies of all descriptions. The States and Territories are represented by female figures hand in hand, symbolizing the indissoluble chain of union. Constellations of stars indicate their number.

In the place of honor, in the axis of the monument, are written the names of the thirteen original colonies; and upon the “Stela,” guarded by the eagle, is the goddess of the twentieth century, the modern Minerva, flanked by ranks of lions roaring the glory of America.

At the base is a great amphitheatre, forming a sort of sanctuary where orators, philanthropists, and *savans* may deliver inspiring words before the altar of their country. In the interior, elevators conduct to different stories and balconies, as well as to the powerful beacon placed fifteen hundred feet above the ground.

In the lake itself, facing the monument on the other side of the esplanade, is to be a basin of vast dimensions for regattas, with seats for one hundred thousand persons.

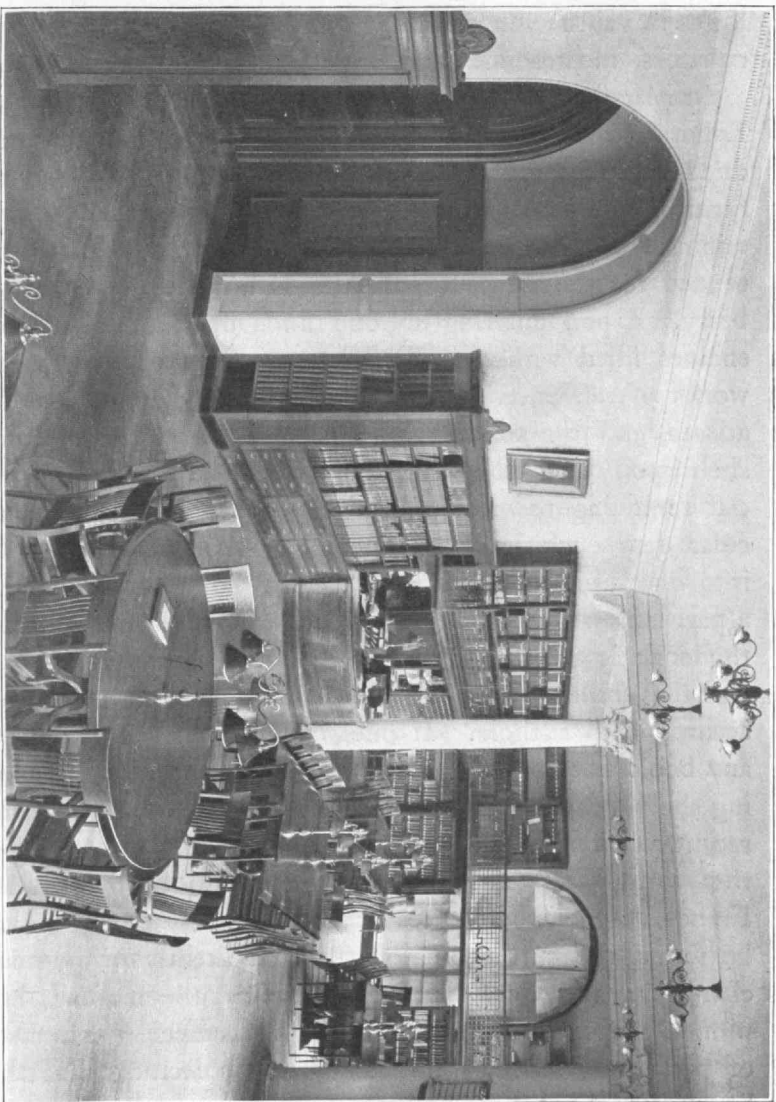
A brochure will be issued, giving a more complete explanation of the monument, together with the principles of its construction and the expense.

THE LIBRARY

A few years ago it was not unusual to have some one of the older graduates come into the office of the Librarian, and remark: "You have been changing things here. This used to be the Society of Arts room." Then he might go on and speak of the wonderful enthusiasm of President Rogers, and he might relate how, when the society lacked other subject for discussion, the President would sometimes take a little stone from his pocket, and, using this as a text, deliver offhand a discourse that would hold the interest of the members of the Institute for an hour or more.

That room of so much historic interest has undergone another change. Where once stood the little glass cage, called the Librarian's office, is now the Committee Room. The partition that separated off a part of the room for the use of the Secretary is removed, and the whole is now the seat of administration. The blackboards, brought to view again by the removal of the library bookcases, have been painted over, and the transformation is complete.

Now the visitor, who, returning for the first time to view the scenes of his early struggles with "Gen. Biol." and "Comp. Anat.," in the old room at the end of the Rogers corridor, misses the familiar odor of alcoholic specimens, is



Institute of Technology.

surprised not to find himself in a maze of glass cages, and looks in vain for an imposing array of steam sterilizers, incubators, and reagent bottles.

In place of the once familiar features of the Biological Laboratory he finds a stately hall, its walls colored in subdued tints, its roof supported by Corinthian columns, its furniture of mahogany, and on all sides open shelves containing books in orderly array. This room, originally intended for the Museum of Arts, is now the General Library. Upon entering it, one finds upon the left hand shelves filled with encyclopædias, dictionaries, and other works of reference. These rest upon a tier of drawers for atlases, and the top of the atlas case forms a projecting shelf upon which the heavy books may be consulted without removing them to the tables. Beyond this is a circular desk enclosing a low opening in the wall which leads into what used to be the mineralogical laboratory, of which a part is now the Librarian's office. On the other side of the desk is the general card catalogue, containing in one alphabet the titles of all the books in the Institute arranged according to authors. If one wants to know the title of any book not to be found in the catalogue, on the adjoining shelves are printed lists of everything published within recent years in the four great book-producing countries of the world,—England, the United States, Germany, and France. Upon the shelves to the right of the door are to be found the current periodicals of a literary or popular character; and over them on a large bulletin board are pinned maps illustrating the march of current events, lists of prescribed readings, notices of public lectures, and the like. The books on Military Science are at the west end of the room, and near them a collection of the publications of the Institute, its officers and graduates; while the east

end is devoted to American, English, German, and French literature. In another place are the books on the science of language. In the galleries are kept books which are less frequently used. In one are the school and college catalogues and educational reports; and the bound volumes of periodicals are kept in the other.

But the General Library, with its seven thousand volumes, is only one of the eleven libraries of the Institute, which contain altogether over fifty thousand volumes and more than fifteen thousand pamphlets and maps.

Our system of departmental libraries is the result of a gradual growth from small beginnings. At first the heads of the various departments bought such books as they needed from time to time for purposes of instruction. In this way about eighteen thousand volumes had accumulated, when, in 1889, it became evident that more systematic attention was needed for this branch of the work; and Clement Walker Andrews, A.M., Instructor in Chemistry, was appointed Librarian of the Institute. To him was delegated the duty of purchasing all books for the Institute upon requisition of the heads of the teaching departments; and he was intrusted with the cataloguing, arrangement, and general supervision of all the libraries.

During the first decade of the existence of the Library as a distinct executive department the number of books has increased threefold. The mean annual increase for the ten years ending September 30, 1899, was 3,260 volumes.

It is needless to say that the office occupied by the Librarian and his Assistant is one of the busiest places in the Institute. Librarians may come and librarians may go, but the ebb and flow of books through this small room never ceases. Before one lot of books can be despatched to the libraries, another wave of literature is tumbled upon them.

Each book, when it arrives, is examined to see if it is one that has been ordered. If found correct, the bill is recorded and approved; and the book is entered in the record of accessions, and receives the stamp of the Institute. Then the catalogue cards are written, often several being required for a single book. These are copied, the original cards are filed in the general catalogue, and the copies are sent, with the books, to the departmental libraries. During the last few years the new books for the Physical, Chemical, and Engineering Libraries have been catalogued by the assistants in charge of these libraries. Thus a certain amount of work has been transferred from the General Library, but it still requires the supervision of the Librarian.

But this is not all. About eight hundred serial publications — dailies, weeklies, monthlies, quarterlies, and annuals — are received regularly. Each issue as it is received is recorded, and sent to the library where it is to be kept. When the volumes are completed, the separate parts are gathered together, arranged for binding, directions written and recorded, and finally sent to the binder. When the bound volumes are returned, they are examined and recorded again, the bills are approved, and the books are entered in the record of accessions, and catalogued like new books. While all this is going on, orders are being issued for new purchases; and, moreover, the Librarian is expected to keep himself informed of all that is published in English, German, and French, and to bring to the attention of heads of departments all new books that may be of interest to them.

The work of the Librarian has its pleasures and its trials. It is pleasant to instruct the gentle Freshman in the use of the Library. Generally, he asks where he can find the book that he wants. Sometimes he asks if there is "any kind of

a catalogue" by which he can find it. In any case he is referred to the general card catalogue, for a knowledge of the use of this instrument is regarded as an important part of his education. Frequently he returns with the query as to where he can find some such number as this: "12+627p. 106 il. 15 pl. O."; and his surprise and gratitude are truly delightful when he finds that, while these figures describe very accurately the number of pages, illustrations, plates, and the size of the book, the number by which he can find it upon the shelf is something quite different and very much simpler. But in the midst of the rush of work at the beginning of the term, when everything is being hastened to the utmost, it is painful to be interrupted by a young laboratory assistant with his S.B. hardly dry, who desires, with a lordly air, that this or that be hurried up. And it is still more painful to have a member of the Faculty come in, and ask, with evident expectancy of a negative answer, "Is there *any* way that you can tell whether such and such a book is in the Library?" Then, as we point to our catalogue of forty-five thousand cards, we wonder whether much of our work is of any use, after all.

The books in all the libraries of the Institute are arranged upon one system. This is the Dewey Decimal Classification, not invented by our genial professor of economics nor by the hero of Manila Bay, but by the well-known librarian of the New York State Library. It is a system that is very puzzling to the beginner, but it is quite simple when once the principle is understood. The whole realm of human knowledge is divided into ten branches. Each one of these is separated into ten divisions, which are subdivided by ten again; and so on to any degree of minuteness that one wishes. General works are given the

general numbers, and so come before the more special works on the branches of the subject. Thus 800 indicates general literature, 810 is American literature, 811 American poetry. American poetry of the middle of the present century is placed under 811.3, and the poetical works of Longfellow receive the number 811.34.

The Institute may well be proud of a library that surpasses that of any other technical school in this country, and compares favorably with those of the best technical schools of Europe. Still, we want more. We have three library funds—the Charles Lewis Flint Fund, the Rotch Architectural Library Fund, and the William Hall Kerr Fund for the purchase of books and drawings in machine design; but we have no fund for the purchase of books of a general character for the General Library. Other things as well as books are needed for this Library. The fireplaces, with their mahogany mantels, stand cold and cheerless, devoid of andirons or fender. Upon the walls we have portraits of William Johnson Walker, M.D., whose timely gift saved the Institute in the darkest hour of its infancy; of Richard Perkins, whose fund enables many a student to gain an education that would be impossible without this help. We have a bust of Albion K. P. Welch, who gave the most useful kind of a fund, one “for general purposes”; and we have that magnificent King Arthur that General Walker used to admire so much as an expression of perfect chivalry. But there are many vacant places upon the walls and bookcases which should be filled with pictures and busts. Especially we should have a portrait of Henry L. Pierce, whose generous legacy made it possible to move the Biological Department to more commodious quarters, and gave us this room for a General Library.

ROBERT PAYNE BIGELOW.

THE NEW PRESIDENT TO THE NEW STUDENTS

RÉSUMÉ OF PRESIDENT PRITCHETT'S ADDRESS TO THE
CLASS OF 1904, SEPT. 26, 1900

I am sure that you can scarcely understand the pleasure which I have in assuming once more direct relations with students, and especially with students who have in view a definite and earnest purpose.

I am here at this time not to give any formal advice. In fact, I am rather of the opinion that formal advice has far more influence with the man who gives it than with the man for whom it is prepared. I am here most of all simply to meet you, to look into your faces, and to say that the Institute welcomes you to her doors and to her activities.

One of the important things for one to settle at the beginning of such a Course of Study as that which you are about to take up is definiteness of aim and purpose. It is important for you to know something about what you are doing, in order that your steps may lead somewhither. A path entered upon at random and having no end in view is apt to be circuitous and difficult.

I was influenced by certain definite considerations in coming to the Institute.

Among the considerations which influenced me was my belief in the growing importance of engineering education. To my thinking there has never been a time when the training of competent engineers was more important or when the outlook for the well-trained engineer was so encouraging. You enter your studies in preparation for

the work of an engineer at a most promising time, and the next quarter-century is to be pre-eminently the engineer's age.

Another consideration which influenced me in coming to the Institute of Technology was the high ideal which the Institute has always maintained and the skill and the devotion which its Faculty has always shown. These considerations had weight, I am sure, with you as well.

A third consideration which weighed with me, and most strongly, was my feeling concerning the spirit of the student body itself, so far as I know it. It is a great inspiration to feel that you come here with serious purpose and a real spirit of work, that you are here to do a man's work and to do it in a man's fashion, and that in dealing with you I am to deal with you as men who know their own minds, and have begun, in an energetic way, the work of their lives. I am glad to know you as men.

On your part, I judge that you have come here with the purpose to acquire a training which shall fit you to be engineers later. And, in using the term "engineer," I use it in the broad sense of one who employs scientific methods to the solution of practical problems.

In this purpose, and in the pursuit of this object, let me add one suggestion.

The engineer is becoming every day more and more an executive. The trained man is coming to direct, in constantly increasing ratio, the labors of the untrained or of the poorly trained man. As an executive, it is the business of the engineer to obtain from men under him — men of varied qualifications and imperfections — the results sought. To bring out good results with imperfect subordinates and imperfect means is the end of good administration. Any sort of administration would succeed with perfect men.

The problem which the engineer has to face is that of bringing out his results with imperfect men and imperfect means.

To attain this end,—to be able to take men with their prejudices and with their imperfections, and still achieve results,—it is necessary to take into account the point of view of others; to understand, to some extent, not only the wishes, but the weaknesses of men; and, taking these into account, to deal with them in such a way as to bring out good results.

There is a saying of Confucius that the wise men who wished, in the olden time, to govern well the empire, first sought to govern well their own states; in order to govern well their own states, they first regulated their own families; to regulate their own families, they first put in order their own persons; and to bring into order their own persons, they sought first to rectify their own hearts. And so it is that the governing of an empire begins in an examination of one's own motives.

In the same way, let me say to you that, in seeking to become engineers, see to it that you are, first of all, men; and, in seeking to become men, cultivate that form of manliness which takes into account the point of view, the rights and even the prejudices of others with whom you have to do. That form of unselfishness which takes account of the rights of others is the best means of removing the friction of every-day life.

In conclusion, let me say that I am here to help you if I can do so. I desire to know you and to make your acquaintance; and I need your help as much as you can possibly need mine. I shall be glad to have you come to me as freely as you will. My office will stand open much of the time,—I believe in the open-door policy. Whenever you wish to consult me in regard to any subject, do not hesitate to come.

We are working here, all of us, for a common end. I feel that we shall attain that end all the better by a more intimate knowledge of each other and of the purposes of the other. Furthermore, I feel sure that, in knowing each other better,—both students and Faculty,—we shall not only do better work in the preparation for engineering, but also shall progress toward a better and stronger and higher manhood.

SUMMER SCHOOLS, 1900

MINING ENGINEERING

These summer schools, which were initiated by President Runkle in 1871, have been held nearly every season since that date. The summer school tends to influence students in two ways,—to excite their interest and to widen their experience.

To excite their interest.—Students may be divided for purposes of this discussion into two classes: (1) the interested workers, who come to college because they want that which the college has to give; and (2) the indifferent, who come to please their friends. Any line of policy which will make more efficient the work of the first class is to be commended. But if, at the same time, it will go further and promote some of the second class to the first it is still more to be commended.

We are interested in what we have seen.—If we visit a magnetic concentration plant, following through the course of the ore to see with what care the crushing apparatus is chosen to avoid making too much fine dust, and the magnetic apparatus is chosen to eliminate at the earliest moment the greatest amount of waste material, to set one side a middlings product for recovering the grains of magnetite that are still attached to quartz, and, finally, to save the magnetic mineral as free from quartz as possible, we can hardly fail to become interested in the plant.

We learn easily and study with zest that in which we are interested.—The magnetic plant, as a result of our visit, assumes a new place in our world. It has ceased to be an abstract something and has become a concrete reality, about which we know a good deal and want to know more. Our interest is thoroughly aroused. Moreover, there is a fellowship among students with



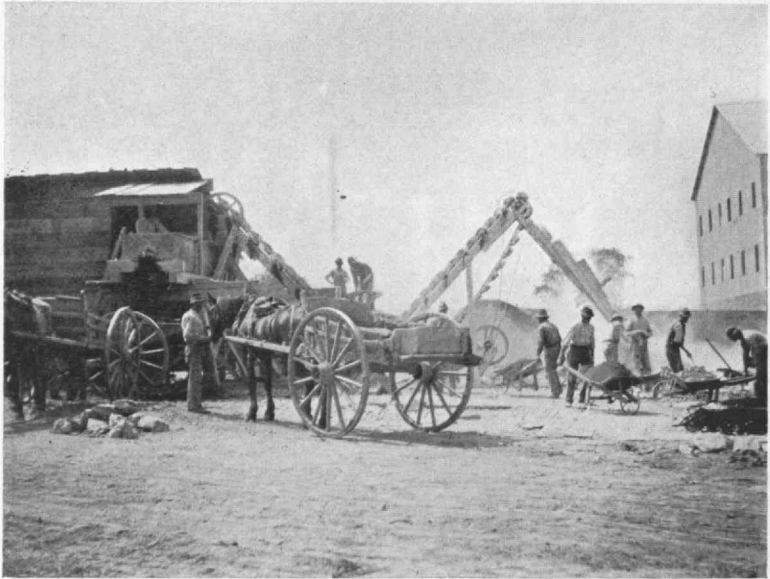
Group of Mining Engineering Students, Dover, N.J.

more or less momentum accompanying it, the indifferent minority being drawn into the current and some of them permanently joining the strongly interested workers, with great advantage to the former and no disadvantage to the latter.

To widen experience.—This is in many cases the first visit the student has made to works; and, therefore, the first time he has seen the machines about which he has been studying. It is to be followed by many other such visits all through his life; but, since his experience at this stage along these lines is practically *nil*, he

will make a greater step in gaining experience than he is ever again to make in his life.

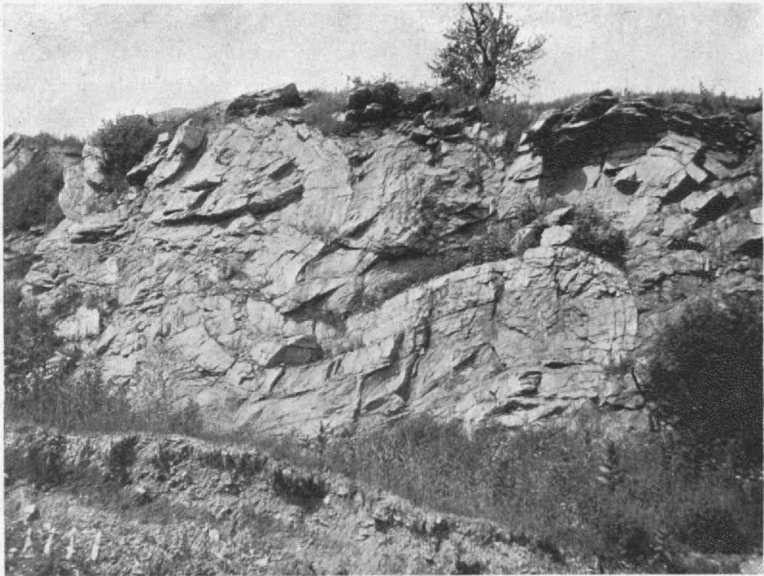
The summer school of Mining Engineering of 1900, including some of the students of the second, third, and fourth years, who were able to avail themselves of it, accompanied by three volunteer instructors, visited New Jersey and Eastern Pennsylvania. The



Mixing Concrete for Walls of Buildings, Coplay, Pa.

methods of laying out the work, of excavating, hoisting, pumping, and ventilating, were studied in two magnetic iron mines, the Richards mine and the Andover mine, and in one large coal mine, the Mahanoy City colliery. The method of dressing anthracite coal was also studied at this colliery. The methods of magnetic concentration were studied at Hibernia and at Edison, and of mining and dressing brown hematite at Ironton. The method of making hydraulic cement was well illustrated by five large works at Coplay, where this comparatively new industry is making enor-

mous strides. A fine opportunity to study the zinc oxide and spelter furnaces was given by the New Jersey Zinc Company. The iron blast furnace of the Thomas Iron Company illustrated the methods of iron smelting. A special train furnished by the Thomas Iron Company greatly facilitated the visits around Coplay and Ironton. At the Bethlehem Steel Company the students had



Folded Strata near Hokendauqua.

an excellent chance to see the open hearth steel furnace and the making of built-up guns.

The writer wishes to express his deep sense of obligation to the owners and managers of works for the kindly way in which they opened their works to the students, but especially for the interest they took in helping the students to make the most of their visit.

ROBERT H. RICHARDS, '68.

CIVIL ENGINEERING

Of the hosts of people who have been to New Hampshire this summer for a few weeks' outing, to enjoy the bracing air and the beautiful scenery, there are few who bring home pleasanter memories than do those who went with the little summer school party from "Tech." While the main object of the summer school in topography is business rather than pleasure, there is always a generous share of both; and this year was no exception to the rule.

While looking for a suitable place for the school this year, we were attracted, by rumors of good hotels and by recollections of former travels, to the shores of Lake Sunapee. An examination of the country in April showed that we had found the right spot. There were opportunities for the various kinds of work and ample hotel accommodations. We decided to make our headquarters at Burkehaven, a sheltered nook on the west shore of the lake, not very far from Sunapee village.

By the 6th of June all preparations were made, and we boarded the train for the "Lake Station." Everything had started well, and promised a pleasant school.

It was a hot and dusty day; and the change from the train to the little lake steamer, "Lady Woodsum," was welcomed by all. It was a beautiful sail up the lake, and came to an end all too soon. We were met at the landing by our host, who led us up a pleasant wood path to the hotel. We spent the evening getting settled in our new quarters and in looking at the charming scenery from the piazza. During the evening the bulletin board was put up, and the assignments for next day's work posted.

Early next morning four parties left the hotel. Two levelling parties, under Messrs. Delano and Russell, were to run lines of levels from the railroad up to a point where we intended to measure our base line. The third party looked along the river for a gauging station, while the fourth went hunting for triangulation points. The latter party took a ten-mile tramp in the forenoon to get into training for what was to follow, and, as a result, had a triangulation scheme laid out and a tremendous appetite for dinner.

In the afternoon one section of the party, under Mr. Thurber, measured a base line in a low, flat meadow below the village.

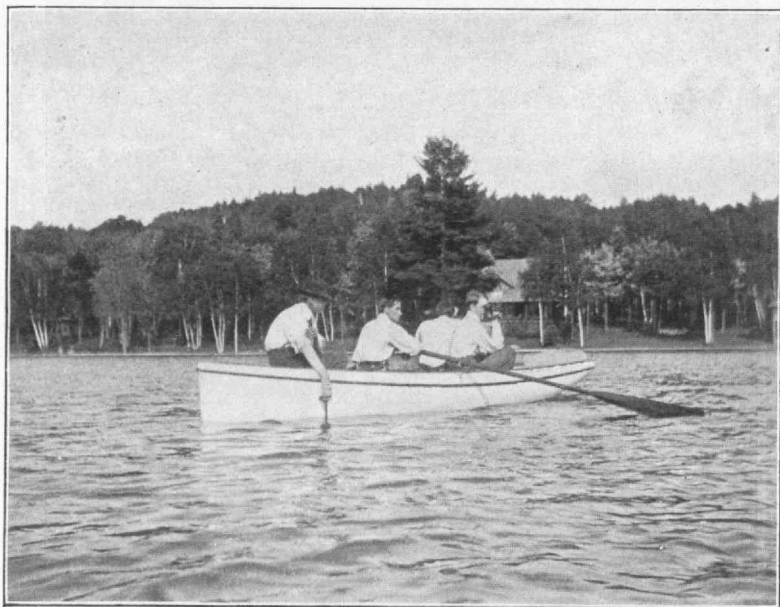


Road Traversing with Plane-table.

The remainder of the party built signals on the summits of the surrounding hills. Following our custom of naming signals for members of the party, "Briggs's Signal," "Lange's Signal," and "Pete's Peak" were duly recorded, and will go down to posterity on our plane-table sheets. The work of measuring angles and

levelling was pushed along rapidly, and we soon had our scheme computed and plotted on the plane-table sheets. The framework of the survey was completed.

On Monday morning the first plane-table sheet was in the field, and the work of making the map actually begun. Soon other parties were sent out, and it was not long before a plane-table

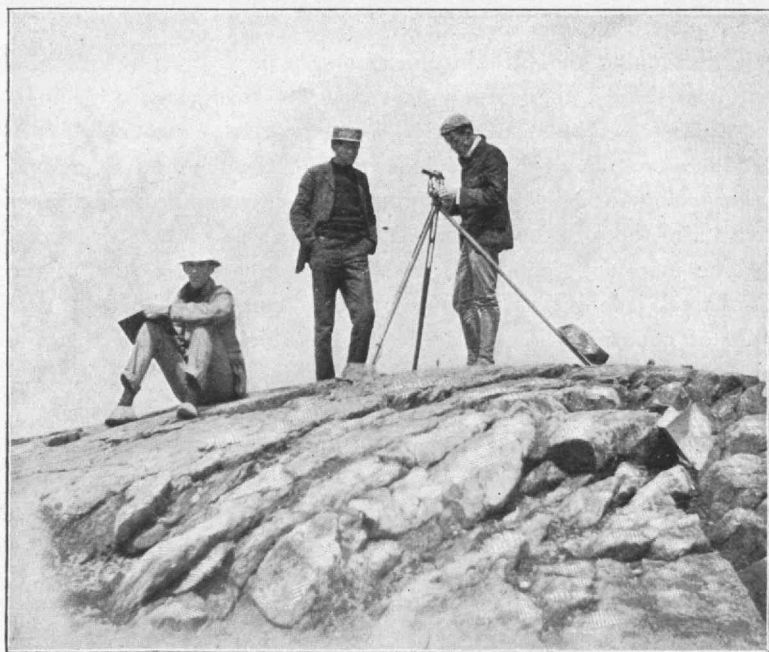


Taking Soundings in Sunapee Harbor.

party was a common sight in Sunapee. Meanwhile Mr. Sweet and his party were gauging the river at a point below the village with every kind of meter and float ever invented. The work was now well under way. We all worked hard, and enjoyed it. The weather was very considerate indeed, and allowed our work to progress finely. When a rainy day came, we went down to the harbor and made soundings from a boat, locating them by two sextant angles between signals on shore. When the weather was clear, we continued the map-work with industry.

The work had not been going on long before it was learned that there was a baseball team in the village, and arrangements were soon made for a game with the "Techs." After this the evenings were devoted principally to practice for the game.

In order to make our work complete, it was necessary that our system of triangulation should be connected with some line estab-



On the Summit of Mount Kearsarge.

lished by the United States Coast Survey. Consequently, it was decided to send one party to Mount Kearsarge and another to Mount Sunapee, while a third should remain at Burkehaven Hill. The angles of this triangle were to be observed, the pointings to be made on "heliotrope" light. We had no regular "heliotropes"; but, by the aid of a village carpenter, we very soon had a number of them which served our purpose admirably. We supplied ourselves with axes, cameras, "heliotropes," and lunches, and sailed

down the lake. At the station the Kearsarge party took the train, while the Sunapee party drove in a farm-wagon to the foot of the mountain. The ascent was not easy; for there was no path whatever, and fallen trees and thick underbrush made it rough climbing. All parties reached the summit at about the time appointed, and the angles were successfully observed. Every one returned satisfied with his mountain trip, which made a pleasant change from the regular work of plane-tabling.

One evening the little steamer brought to us Professor Barton, who was to be with us a few days, and who made several geological excursions with small parties. On these trips each man found he had need of all his previous training in mountain-climbing. The geology of Sunapee was pronounced monotonous, but farther south a region was found where a day's trip was well worth taking.

The map-work continued steadily, and toward the end of the third week it looked as though we should complete about a square mile of country. Some places were so thickly wooded that the plane-table was of little use, and the "transit-and-stadia" method had to be used instead. Meanwhile the Sugar River had been completely measured. The hydraulics party was now on the lake, rating the meters. This was done by moving the meters through still water at a known speed, the reverse operation of measuring a current. Every part of the work was so far along that there was now no doubt that the usual amount of work would be accomplished this year. The end was near, and each began to make his plans for the vacation.

On Saturday afternoon, the 23d, the ball game, so long looked forward to, was to be played at Newport. Immediately after lunch the coach and four appeared. After decorating it with red and gray, the merry party drove off, blowing horns and cheering, ready to beat or to be beaten, but bound to have a good time. They returned badly beaten, but not a whit cast down, and earned for themselves the name of "taking it well."

Sunday evening, upon the kind invitation of the village people, we went to the little chapel near by (which had not been opened before), and sang gospel hymns. And here we ought to say that

during our three weeks there no one could have done more to make our whole stay enjoyable than did these people at Burkehaven.

GEORGE L. HOSMER, '99.



Porch to Rufus Greene Estate, Providence, R.I.

ARCHITECTURE

Following the precedent established in 1894, the summer work of the architectural students consisted this year of a detailed study of old colonial buildings. At first it was intended to examine buildings within a short radius of Boston, using the Institute draw-

ing-rooms for all the indoor work that might be required. Preparatory visits, however, limited the places to be examined, and encouraged the belief that careful studies in one locality would give better results and prove far more satisfactory than a large number of poorly drawn examples. Therefore, after a preliminary talk in the department lecture-room, the class of eleven students invaded



South Door, First Baptist Church, Providence, R.I.

King's Chapel, and began to measure the fine columns and details of its famous interior.

In this quiet place the necessary drill in the new work was given; and each student learned to appreciate the value of a systematic plotting of lines and measurements, so that the whole could be successfully drawn out at a later time. Although perched upon ladder and steps, with note-book, rule, and lead in hand, the time went quickly by until the darkness following the setting of the sun behind the adjoining high buildings suggested the brushing of clothes

and the washing up for the day. Later visits completed this interior, and we were much gratified to find that our drawings showed that many errors had been allowed in the published drawings of this building.

The next morning the class took an early train, each student abundantly equipped with drawing boards and instruments, tapes,



House Door, No. 9 William Street, Providence, R.I.

two-foot rules, lead strips, and all the tools of the trade required for a ten days' architectural tour among the quaint doorways and excellent details of the colonial houses and churches of Providence. Thanks to the courtesy of the officers of the Rhode Island School of Design, we obtained an excellent room as a rendezvous, and soon were comfortably established in cool quarters, well adapted for our day or evening work.

Then began the detailed study of that stately old building, the First Baptist Church, beautifully placed among fine trees on the

steep hillside just above the former business section of the town. Though erected in 1775, the church is still in excellent condition. We were soon busily swarming over its white porches, columns, and spire, to the edification of the passers-by, and incidentally to our own great benefit. As the building has never been measured, and its detail is in the main refined and well worth drawing, we were particularly careful to make a conscientious study of its nicely proportioned mouldings.



Gang of Students at Newburyport.

The spire is remarkably dignified and effective; and we were much interested to find that it was built from an alternative design by James Gibbs for the spire of St. Martins-in-the-Fields in Trafalgar Square, London. From a book of Gibbs' designs in Mr. Alfred Stone's office we could easily compare the design and spire, and found only a few changes at the square base. Indeed, we owed this and many other bits of information to Mr. Stone's kindness; and I am happy to say that the success of our work was mainly due to his unfailing interest and courtesy.

During the days and evenings of our ten days' visit, many Providence doorways were transferred to paper; and our rough sketches, scale drawings, and photographs form a very valuable collection of

colonial details from a section of New England that thus far has never been studied in this way. Our Salem and Portsmouth drawings made in '94 and '95 will shortly be published in the "Georgian Period." This summer's studies will also help along the good work by preserving for published form many designs executed in wood, that will sooner or later disappear through neglect or decay, through fire, or changes demanded by city improvements.

Among many of the Providence buildings that might be men-



House on Road to Ipswich.

tioned, the interior of the Unitarian church, with its fine pulpit, the simple yet dignified doorways of Angel, George, William, and Arnold Streets, the curious plan of the twin houses, yards, and out-buildings of the Rufus Greene estate, or the generous house and grounds of the Edward Carrington mansion, afford unusual opportunities for the student of colonial buildings. Yet much remains undone, for our time was not sufficient for an exhaustive study. With a large amount of material in hand, we returned to Boston, and spent the remaining days in accurately drawing out the sketches and rough studies. This work was necessarily slow and confining; but the routine was broken by a bicycle trip through the old towns of Wayland, Concord, and Lexington, where many small photographs and a few drawings were made.

Our real outing, however, was found during the hours spent in the clear sunlight of a perfect summer day on the old turnpike between Newburyport and the Parker River. Stopping many times to sketch and photograph old houses, shaded by grand elms in good New England fashion, we reached the river in time for a somewhat questionable fish dinner. The long siesta that followed was enlivened by Clark's vain attempt to sail against the outgoing tide, and by the exciting races of the horseshoe crabs, until in the cooler temperature we wheeled back to sketch the picturesque Garrison House, then on to the Chain Bridge over the Merrimack, and so back to town again.

After visiting the large schooner building on the river bank, a picnic lunch was purchased, a sail-boat chartered, and supper and the cool evening enjoyed on the waters of the harbor. With only a light breeze to work home against, there was plenty of time for stories, songs, and that delicious laziness only to be found on the water. So, later on, we hunted up beds in town, and the Summer School of 1900 was ended. To be sure, a few drawings were completed, negatives developed, and odds and ends picked up during the following days. The three weeks of attractive work and good fellowship proved to be instructive and enjoyable, and, it is assured, will be of greater architectural importance than was at first anticipated.

E. B. HOMER, '85.

EDITORIALS

To acquire a proper conception of the breadth of the Institute's sphere of influence, one must perforce travel; and, if any Tech man should contemplate an extensive tour through the country, and should feel in any way anxious about the safety of railroad travel, he might reassure himself by starting on the Boston & Albany, of which Shepard, '72, is chief engineer. On reaching Albany, he could then make his way either to New York City or to Buffalo by way of the New York Central, whose superintendent of motive power and rolling stock is Waitt, '79. From New York City the Erie would be available to Rochester, Buffalo, Cleveland, and to within less than three hundred miles of Chicago; for on this road Baldwin, '84, is shown by the last catalogue to be engineer of maintenance of way. Pittsburg is easily reached either from the New York Central or the Erie by means of the Buffalo, Rochester & Pittsburg, Hoyt, '68, being chief engineer. Probably the best route from Buffalo to Chicago is via the Lake Shore & Michigan Southern Railway, with its flat grades of sixteen feet to the mile; and here we find that Handy, '75, is now chief engineer. This railroad is especially desirable from the Tech standpoint, as the three preceding chief engineers were Kimball, '73, Osgood, '78, and Hardy, '70. An alternative route, of course, would be the other Vanderbilt line,—the New York, Chicago & St. Louis, of which Johnston, '73, is general superintendent. Starting at Cleveland, it is possible closely to approach any city in the Middle West by the "Big Four," of which Kittredge, '77, is chief engineer. This definitely connects Cleveland, Columbus, Cincinnati, Indianapolis, St. Louis, and Chicago, and penetrates south as far as Cairo and west to Peoria.

From St. Louis, Louisville is readily reached by the Louisville, Evansville & St. Louis Consolidated Railroad, with Holbrook, '74, as chief engineer. Pretty much all of Michigan is available from the Lake Shore at Toledo by the Père Marquette, of which

Kimball, '73, is now chief engineer; and this line also takes in Milwaukee by means of its car ferry lines.

The Chicago Great Western, which connects Chicago, Kansas City, and St. Paul, is also an excellent Tech line, having as it does for general manager Stickney, '86; for general superintendent, Lyon, '85; and for master mechanic, Van Alstine, '86. This, however, is hardly direct enough to be very popular for passenger travel from Chicago to Kansas City. Most of us would prefer to travel between Chicago, Kansas City, and St. Louis by the Chicago & Alton, Felton, '73, president.

The gap, if there is any, from the Chicago Great Western near Kansas City or St. Jo to the Burlington & Missouri River in Nebraska is in any case small; and here we find as chief engineer Weeks, '71, whose road extends west to Denver and Cheyenne, and likewise pushes northerly into the Black Hills, or, in fact, beyond that to Billings, Mont., on the Northern Pacific, which is so close to Livingston, the headquarters of Division Superintendent Horn, '88, that it is, no doubt, on his division of the Northern Pacific. Beyond Horn's division, for the rest of the way to the Pacific, one would have to be reconciled to taking his life in his hands, away from Institute influences; but the traveller around the world would find awaiting him in Japan, Hongma, '74, president of the Sobu Railroad, director of the Tobu Railway, and consulting engineer of the Hokuyetsu Railway. Intending travellers to Japan will do well to make a mental note of his address in Tokio, — 2 Kabutocho Nihonbashiku.

Some of these railroads have only recently come under Tech control in civil or in mechanical engineering. On the other hand, only two or three years ago a favorable opportunity to reach Virginia and part of North Carolina, starting from Columbus, would have been furnished by the Norfolk & Western, of which Soule, '72, was then superintendent of motive power.

Enough has been said, however, to show how it happens that the good reputation of the Institute is not confined to any section of

the United States, and, further, that it has been made not by its graduates alone; for several of those mentioned above took special courses only, and so are not graduates.

Just at this time when we are specially aware that "presidents come and presidents go, but Tech goes on forever," a word of reminiscence of President Rogers may be fitting, from one who esteems it a bit of ill fortune that no opportunity was given him to experience the magic of his eloquence as a lecturer. Even of his address of welcome to the entering class, little lingers in the memory. But it seems as yesterday (though more than thirty years ago) that he told us, "You now stand upon the pedestal of the Young Gentleman,—you are school-boys no longer," and thus early in the Institute's history sounded the keynote with which later usage has been in full harmony, so that, with no formulated rules for behavior, suspension is an unknown penalty, and expulsion rare, while the standard of conduct excites the admiration of those interested in kindred educational institutions. General Walker's "place for men to work, and not for boys to play," of a later date, is of the same order; and both serve as indices of the fact that the Institute's habit is to appeal to the manly side of its students,—that it serves to develop virile force in the training of young men, as Rogers demanded it morally and Walker mentally. For a later generation is reserved the opportunity (why not duty?) of first furnishing proper facilities, and then demanding that all students shall become physically strong, just as Rogers and Walker formulated the necessity for moral and mental strength.

It had been hoped that in this number of the REVIEW would appear memorials of two men who, in quite different ways, contributed in extraordinary measure, not only to the right development of the Institute, but also to the infusion of its atmosphere with a manly spirit of honorable achievement. These men were

Augustus Lowell, of the Corporation, and Silas W. Holman, of the Faculty. The summer season being one, however, in which it is difficult to gather materials for such memorials, these articles have been postponed, of necessity, until the January issue. In that number Mr. Thornton K. Lothrop, his lifelong friend, will write upon Mr. Lowell; and Mr. John R. Freeman, his classmate, will write upon Professor Holman.

Mr. Lowell, burdened as he was by heavy business cares and by the exacting duties incident not only to the immense Lowell Trust, of which he was sole trustee, but to many other works of philanthropy and education, found time, nevertheless, to give much thought and energy to the development of the Massachusetts Institute of Technology. As a member of its Executive Committee, and as chairman or member of several other important sub-committees, he was called upon to deal frequently and fully with many serious questions of policy and of finance. With the zeal and self-forgetfulness characteristic of the typical Boston merchant, he gave to all these questions an attention as careful and an expenditure of time as great as though they had been weighty personal affairs. Holding great wealth, he felt that its possession gave him, not additional privileges, but, on the contrary, extraordinary duties toward the Commonwealth and the city,—duties which his native qualities and his wide experience gave him unusual power in fulfilling.

The career of Professor Holman is a striking illustration of the force of personality, of the immense significance of the individual. Although for a number of years before his lamented death it was impossible for him even to leave his house, he was still a leading and a beneficent force in the work of the Massachusetts Institute of Technology. His painful illness and his remoteness from active life seemed in no degree to diminish his interest in the work of the college to which while in health he had contributed so much. On the contrary, the fact that by necessity he was kept aloof from the details of daily routine seemed but to give him a clearer vision of

the larger work of the Institute,— of the still greater achievements which lie within its future.

Absolutely upright, but never austere; singularly sympathetic with young men, but never unwisely lenient; industrious to a marvel, yet fully appreciative of wholesome recreation; patient, exact, clear in his explanations, able to see things from a student's standpoint, knowing how and how far to throw young men upon their own resources,— Professor Holman was a rare teacher, in the ordinary sense of the word. He was still more rare, however, in his appreciation of the true significance of teaching; for he was acutely conscious of the obligation under which the real teacher stands to do much more than to impart information. He felt that he must also inspire in his students high ideals of life, aspirations for real usefulness, enthusiasm to do what they have to do with their whole heart and soul. And, because he felt and fulfilled this duty as a teacher; because, too, he believed in the Institute of Technology, not simply as a great economic, but as a still greater moral force in the community,— his house, after he had been obliged to absent himself from the class-room and the laboratory, was a place of pilgrimage for his colleagues and his students (past and present), to seek there sound advice, to be raised to his high plane of thought and ambition for the Institute, to get new courage for the work of life.

And this has been mainly the cause of the Institute's success: first, that it has had from the beginning men like Mr. Lowell and Professor Holman working for it and believing in it; second, that the subjects of study with which chiefly it is concerned must be taught to individuals face to face in groups of half a dozen, or shoulder to shoulder beside the laboratory table or machine. And, wrangle as men may — and men will until the end of time — over the value of this study or of that, over "content" and "correlation," over "bread-and-butter use" and "culture use," the main

source and foundation of all real education in college and out of college is the direct personal influence of older upon younger men.

The ratio of teachers to pupils is, therefore, a matter of very serious importance. If it be small, then follows, as an absolute necessity, the lecture system, stimulating to a few students, ineffective with the majority, unless supplemented by personal teaching of some kind and in considerable measure. And the lecture system demands a curriculum made up of subjects that readily lend themselves to teaching by wholesale. As note-taking is not "doing" in the educative sense, and as the influence of a lecturer, however distinguished, is in no degree comparable with that of a teacher who meets each individual pupil face to face, both colleges and schools are steadily diminishing the number of pupils to a teacher, to the end that the instructor may know his students as men, and not simply as masks in a sea of faces. But mere number in the matter of teachers is, of course, not enough. If young men are to be brought in small groups under the influence of older men (call them professors, instructors, teachers, or what you will), it is infinitely more important that those older men should be real teachers than if they are to meet the students only in great bodies in the lecture-room. The choice of even a new laboratory assistant may lead, then, in a modern college—especially in a college like the Institute of Technology—to ultimate success or failure; and the phenomenal career of the Institute has been due, in an astonishing measure, to the fitness, as real teachers, of the members of its instructing staff.

So obvious and so true is this that it is still the habit in some quarters to sneer at the apparatus, the machinery, what one may call the tools of instruction, in a college, as so secondary to the men who teach as to be really of no account. But that is an error as great as the opposite one of subordinating the man to the machine. We have been told to the point of weariness about

"the man behind the gun"; but, even though that man be a Yankee of the best type, he can do little execution in modern warfare unless the gun be of modern type and of perfect mechanism. It takes both the "man" and the "gun" to accomplish anything in a battle of to-day; and no modern college can afford to economize either in its teaching staff or in the apparatus (be it books or machines) with which they are to teach. The danger in the classical college is that the great teacher should not be given the best tools and methods with which to teach. The danger in the college of science is that there may be a too liberal furnishing of apparatus and of other aids to instruction without due attention being given to the men who are to teach. To steer between these dangers requires wisdom, foresight, breadth, and courage.

The following paragraph is taken from the Boston *Transcript* of Sept. 4, 1900:—

The secret of the methods of Lord Russell, England's late chief justice, as told by the chief justice himself, was the following: "If you ask me," he said, "to reduce the common habit of my life to a formula, I will tell you that I have only four ways of preparing my work. First, to do one thing at a time, whether it is reading a brief or eating oysters, concentrating what faculties I am endowed with upon whatever I am doing at the moment; secondly, when dealing with complicated facts, to arrange the narrative of events in the order of dates,—a simple rule not always acted upon, but which enables you to unravel the most complicated story and to see the relation of one set of facts to other facts. My third rule is never to trouble about authorities or case law, supposed to bear upon a particular question, until I have accurately and definitely ascertained the precise facts. The last rule is one which the professional man will appreciate better, perhaps, than the layman. It is not only valuable,—I may say this, as I did not invent it,—but very interesting to me individually, as I got it from Lord Westbury, when a young hand at the bar and pleading before him.

I was plunging into citation of cases, when he very good-naturedly pulled me up, and said, 'Mr. Russell, don't trouble yourself with authorities until we have ascertained with precision the facts, and then we shall probably find that a number of authorities which seem to bear some relation to the question have really nothing important to do with it.' My fourth rule is to try to apply the judicial faculty to your own case, in order to determine what are its strong and weak points, and in order to settle in your own mind what is the real turning-point in the case. This method enables you to discard irrelevant topics, and to mass your strength on the point on which the case hinges."

If some enthusiastic graduate of the Institute were called upon to formulate reasons why the engineering education should be recognized as the most effective preliminary training for the prospective law student who is to become later a practitioner, it would be indeed a marvel if he succeeded in setting up as strong a case for the technical training as is stated in the unprejudiced statement of Lord Russell himself. Touching his first rule, the subjects forming the backbone of an engineering course are in their nature such as to require concentrated attention upon definite and specific points; and the methods of instruction in common use are naturally directed to this end. The recitation in mathematics, the problem solved in class, the informal and the formal examination alike demand concentration of mind upon the special principle involved. A general idea of the subject, loosely held, is of little account in Institute work, as so many have discovered to their sorrow.

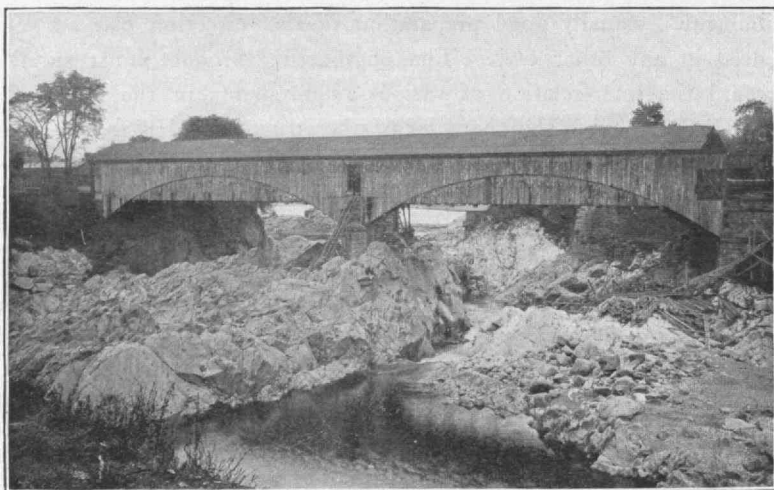
As to the third rule, it is the special province of applied science to deal with ascertained facts and to apply the established laws of nature to these, very much as the lawyer applies the rules of municipal or other law to the facts found to exist in the cases with which he has to deal. The engineering student must necessarily

be trained to apply laws (often mathematical) to facts, and it is just this training in applying laws to facts which Lord Russell found so necessary for the lawyer. The student trained in engineering science has learned to reject that theory of physical law which fails to harmonize with the facts in evidence, just as the lawyer finds that his case cannot be won by citing bushels of law having no application to the facts. Furthermore, in relation to his second rule, scientific training well-nigh of necessity demands system both in the observation and in the recording of facts; and it is doubtful if equally good preparation in this direction can be secured in any other way. The engineering product must surely regard the inter-relation of various requirements in the form of data or facts fixing the character of the structure. His fourth rule specifies the analytical quality of mind as necessary in order to determine the essential and critical points involved in the case, so that one's efforts may be economized and concentrated where the opportunity or the necessity fixes the true fighting ground. That the mathematical and engineering education develops the requisite analytical qualities goes without saying; nor can there well be a fair doubt that the scientific education and habit absolutely demand that honest striving after truth which, as a habit of mind, is virtually a synonym for the "judicial faculty" to which Lord Russell refers. The value of an education such as the Institute offers is already well established as preparation for the practice of the engineering professions. The time is nearly ripe for the public (to say nothing of our own graduates) to appreciate the engineering training as a true liberal education, and, further, as an especially good preparation for the study and practice of the law or of medicine or even for the ministry, where there is greater necessity for the exercise of the "judicial faculty" than has commonly been recognized.

EXAMPLES OF NOTABLE PUBLIC WORKS BY INSTITUTE MEN

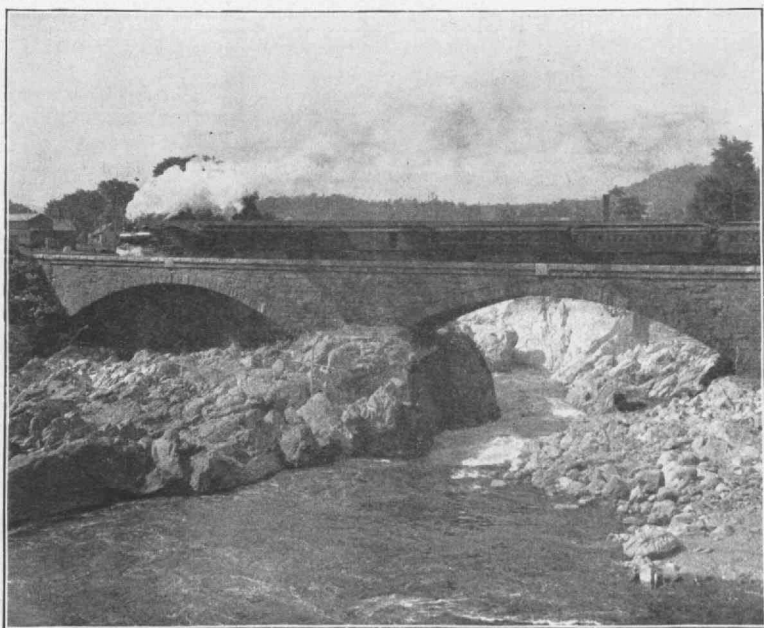
THE STONE BRIDGE AT BELLOWS FALLS

The longest span yet built in this country for a stone arch bridge to carry a railroad is to be found in the new bridge at Bel-



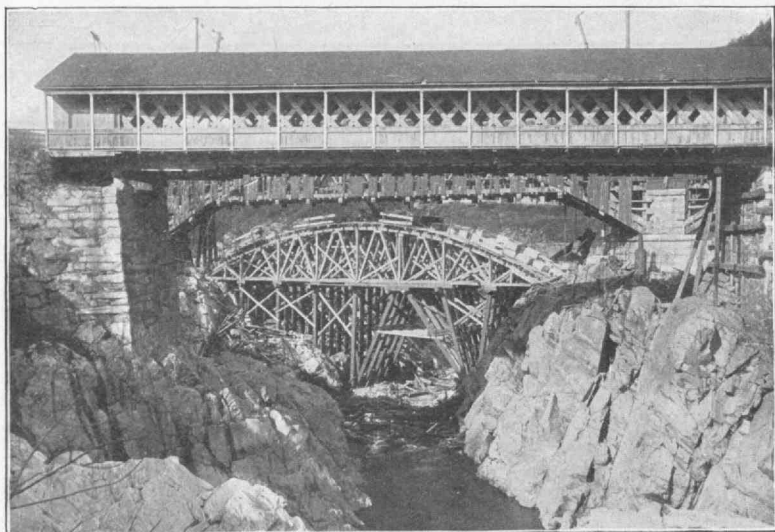
lows Falls, Vt., which has two spans of one hundred and forty feet each. It replaces the old bridge built fifty years ago, which was an excellent typical specimen of the wooden construction of that time. In New England, bridge practice has been, and probably still is, on the whole favorable to steel structures. Probably the most enthusiastic advocate hereabouts of the stone arch is J. W. Rollins, Jr., '78, who was in immediate charge of the construction of this arch, on behalf of the contractors, Holbrook, Cabot & Daly, a prominent firm of which Rollins is now a member. His preference for stone arches, however, was previously evident in the work of the abolition of grade crossings at Brockton, where a number of fine arches are due, both in design and construction, to

Mr. Rollins, who was then the resident engineer in charge of work on behalf of the railroad. Earlier work on the new railroad between Walpole and Islington showed the same leaning toward the stone arch, which he has long claimed to be cheaper in cost than a steel bridge furnishing an equally good road-bed, this having been his view of the case even before the great increase in the cost of



steel. Another feature, surprising to many engineers, and which may have been a controlling consideration in the Bellows Falls Bridge, was the possibility of more expeditious construction in stone than in steel. The Brockton experience had demonstrated the possibility of rapid work; and this, no doubt, had much to do with the selection of the stone arch, as the type of bridge to be used at Bellows Falls, by the chief engineer of the Fitchburg Railroad, Mr. A. S. Cheever, to whom is due the credit for the plan adopted, although Institute men will be pleased to know that the details of the plan were worked out (under Mr. Cheever) by a '96

man, C. A. Wentworth. The rapidity of the work can be appreciated if it is understood that the contractors were told to go ahead with construction September 7, and began work on the ground September 13, that the first stone was laid in the northerly arch October 18, and the arch finished October 22. The southerly arch in a similar way was begun November 7, and the key placed November 10; and trains were carried on the arches November 20.

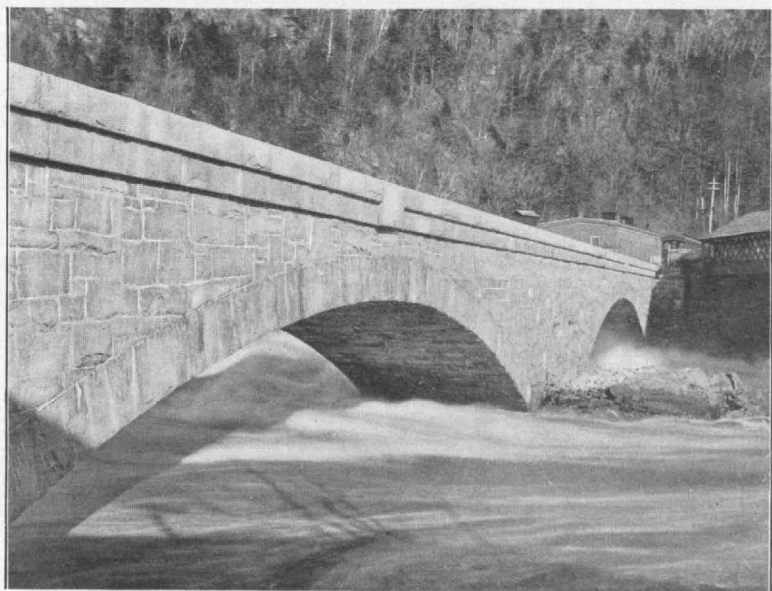


Completing the arch proper in four or five days seems an almost impossible feat, especially in view of the fact that months are sometimes consumed in similar work. It is the opinion of Mr. Rollins, however, that rapidity of arch construction is in many ways desirable. Among other things, the longer the centers stand under a partial load only, the greater is the liability to distortion.

The bridge is built to accommodate a double track, and is twenty-seven feet between faces of the side walls. It was necessary, of course, to provide means for carrying the regular traffic of the railroad; and there was no interference with this during the progress of the work.

An important feature of the construction was, of course, the

design of the centers. Aside from the ordinary features of such structures, it was here necessary, in order to provide for the flow of the river, to span a gorge of forty feet in width, the bottom of which was eighty feet below the rails. How this work was accomplished may be gathered from the illustration. An unusually dry season, with water "the lowest for years," gave excellent opportunity for desirable construction of centers.



A comparison of the levels of the water in the different illustrations will suggest the importance to the contractor of a fortunately dry season. There were some unusual features in the design of the centers, as they were built "without bolts, mortises, or tenons, reliance being placed upon plank patches, and braces thoroughly spiked for stiffness and strength."

Possibly the most pleasing part of it all, to many of us, is to be found in the fact that an able engineer, with special experience in such work, is convinced that, in very many cases, the economical structure is the stone arch, with its graceful, pleasing lines, rather

than the steel structure, which is almost always unsightly, even after we have had time to grow used to it. It is further particularly fortunate when this opinion is held by a man who, in his position as a contractor, is able actually to accomplish work on that basis of economy which, as an engineer, he knows to be entirely feasible,—an important advantage, not always to be secured.

MONTGOMERY WARD & CO.'S NEW BUILDING, CHICAGO

Designed by Richard E. Schmidt, '87

This building has a very prominent location at the corner of Madison Street and Michigan Avenue, two important streets in the heart of the city; and on one side of the Lake Front Park facing Lake Michigan its outline is visible for miles above the general mass.

The owners of this building and business sell only to non-residents of Chicago. As most of these are strangers in the city, this corporation desired a structure that would be known to every one and easily found, consequently a tower was the natural sequence. They also wished that their building contain all the best of modern construction, material, and to be a credit to them and to the city.

The building proper is twelve stories high, fronting but eighty-six feet on Michigan Avenue. The proportions of the tower were studied in relation to this elevation, and resulted in a design in which the tower is the central and major motive, measuring forty feet square at the base and three hundred and ninety feet from pavement to the top of the weather-vane figure, now being modelled by J. Massey Rhind, of New York. This represents "Progress," and is to be in place in a few weeks. The structure is rich in modelled terra-cotta and marble carving, executed by prominent artists.

The three lower stories are of white Georgia marble in rusticated courses. The main entrance is through a pedimented portico, the height of the first and second stories. In the pediment is a marble fronton, modelled by Ph. Martiny, of New York, consisting of a symmetrical group of two lions and two youths each side of a large shield.



The three lower stories are designed as the base of the building, the twelfth story as the capital, and the eight intermediate stories as the shaft. The nine upper stories and the tower are all of mottled buff brick and light terra-cotta.

The panels of the tower are filled with golden tile,—*i.e.*, gold fired on terra-cotta, brightest when the sky is clouded, changing with every sky,—and is to end with the double life-size gilded copper revolving weather-vane figure.

The foundation soil being very uncertain, about 1,200 52-foot 15-inch Norway pine piles were driven to 68 feet below street grade, each to support an estimated load of 25 tons. These piles are capped with steel and concrete. The structure is of full skeleton steel, fire-proof construction. Every square foot of each floor is calculated for a live load of 300 pounds. This heavy floor load in connection with the tower loading required some very heavy columns, the largest having a cross section of 177.7 square inches in the first story, or nearly $1\frac{1}{4}$ square feet of solid steel, or 605 pounds per lineal foot of column.

The window frames of the entire building are metal. The maple floors are the only wood.

The tower contains absolutely no wood. The floors here are of colored cement, in small squares.

The mechanical plant furnishes power, light, heat, and water for three-quarters of the adjoining city square. This consists of water tube boilers, two vertical compound Allis engines, four dynamos, high duty pumps, triplex pumps, Adams patent sewage ejector, carbonic acid ice machine for cooling drinking water, circulating pumps for these, electric passenger elevators, high pressure hydraulic freight elevators, continuous chain elevators, fan system of heating and ventilating, link belt conveyors, ash conveyors, artesian well pumps, sewing-machines, etc.

[It is proposed to publish in the REVIEW, from time to time, accounts, similar to the above, of works of conspicuous interest, designed and carried out by past students of the Institute.]

GENERAL INSTITUTE NEWS

CORPORATION NOTES

The two hundred and eighty-third meeting of the Corporation was held at the Institute June 1, 1900. Appointments by the Executive Committee were confirmed, as elsewhere announced. The degree of Bachelor of Science was conferred on one hundred and seventy-eight graduates, distributed among the various departments, as noted in the July number of the REVIEW. A report, postponed from the March meeting, on the Department of Chemical Engineering, was presented; also, Dr. Pritchett's letter of acceptance of the Presidency of the Institute. But little business has been transacted by the Corporation and Faculty during the summer. The duties of the committees on entrance records, scholarships, and petitions, have not been, however, light. At the July meeting of the Scholarship Committee one hundred and eighty-four applications were examined, and recommendations made amounting to \$16,600. At the September meeting the committee considered supplementary applications and one hundred and eight for the forty State scholarships. This year there were two districts presenting no applications. The income of the Billings Fund becomes available for scholarship purposes the present year.

THE INAUGURATION

In accordance with the authorization of the Executive Committee of the Corporation, Messrs. Wheeler, Wigglesworth, and Williams were appointed a sub-committee to arrange for the inauguration, and Professors Runkle, Swain, Bates, and Tyler an auxiliary Faculty Committee. Mr. Munroe was added to the Joint Committee. It has been determined that the inauguration exercises be held on Wednesday, October 24, at two o'clock, in Symphony Hall, at the corner of Huntington and Massachusetts Avenues. The programme is expected to include an invocation by Bishop

Lawrence, an inaugural address by the new President, and addresses by representatives of the National and State governments and of the Corporation and Faculty. A reception in the library in the Rogers Building will follow.

It is expected that the students will attend in a body, and that invitations will be sent to all graduates.

The occasion should be as notable a one in the history of the Institute as was the impressive meeting in memory of President Walker.

FACULTY AND INSTRUCTING STAFF

Following is a list of the changes in the Instructing Staff for the coming year, so far as now known: Associate Professor Pope has been appointed Professor of General Chemistry; Assistant Professors Vogel, Woodbridge, and Ripley have been advanced to the rank of Associate Professors; Lieutenant Hamilton will be succeeded, as Professor of Military Science, by Captain William Baird, U.S.A., retired.

Professor Webster Wells has been granted leave of absence for a year, and will make an extended tour in Europe, Egypt, and Palestine. Professor Wells's classes are for the present distributed among other members of the Mathematical Department. Dr. William H. Walker has resigned his instructorship in analytical chemistry to accept a professional engagement. Mr. Harry W. Gardner has returned, after a valuable year of European travel and study, to resume his work as instructor in architecture. Mr. Carl H. Clark, instructor in naval architecture, has been granted a year's leave of absence, and will be succeeded by Mr. Walter S. Leland, '96. Mr. Myron L. Fuller, instructor in geology, has received an important appointment in the U.S. Geological Survey. Messrs. Louis P. Chapin, Arthur A. Blanchard, and Miles S. Sherrill have gone to Leipsic for advanced studies in chemistry. Messrs. George L. Hosmer, Alpheus G. Woodman, and Joseph C. Riley, assistants of last year, become instructors. Messrs. Walter B. Russell, Francis H. Watts, Eugene W. Rutherford, Alvan L. Davis, Fred L. H. Kimball, and Etheredge Walker, assistants of last year,

are leaving the Institute for professional work. Mr. Joseph G. Coffin is to be a graduate student at Clark University. Dr. William D. Coolidge has been appointed instructor in theoretical chemistry. New assistants just appointed are R. W. Balcom in analytical chemistry, E. E. Bugbee in mining engineering, W. L. Stevens in mining engineering, L. S. Smith in mechanical engineering, C. M. Fosdick and G. E. Russell in civil engineering.

Professors Chandler, Despradelle, Sedgwick, Hofman, Bartlett, Vogel, and Sumner have spent their vacations in Europe.

PARIS AWARDS

Unofficial reports indicate that the Institute has been notably successful in the awards for its exhibit at Paris. A fuller statement will be made in the next number.

THE COURSE IN ARCHITECTURE

The following is taken from an article entitled "Architectural Education in the United States of America," in the *Journal of the Royal Institute of British Architects*, June 16, 1900 (pp. 394-397), by Arthur Cates:—

"In the late 'forties' and early 'fifties' many smart young architects went from London to the States, and there speedily attained to good and influential positions, prospering greatly. But, as London did not afford any opportunity for sound, systematic artistic education, the young American student did not come here for the instruction which he sought; but a steady stream of earnest aspirants flowed to Paris, where, in the ateliers of distinguished architects and in the École des Beaux-Arts, they found the instruction and guidance they desired.

"This special training of those who now occupy leading positions in the profession, and the developments which have followed the persistent teaching and exertions of Professor Ware, have so influenced the progress of education in the States that the student, if he has not already done so, may soon hope to find at home sources of instruction which will render the course in Paris less necessary,

and even a comparatively superfluous luxury. It has even been suggested that at no distant period the ambitious English student, who may desire to prepare himself for the effective practice of architecture and go through a complete course of technical and artistic training, may find it expedient to resort to one of the American universities, and there obtain that thorough education which sluggish indifference to educational advancement and blind adherence to the antiquated and effete system of pupilage does not afford him here."

"The recent receipt of the Annual Report for 1899 of the President and Treasurer of the Massachusetts Institute of Technology of Boston, U.S.A., and the calendar quaintly described as 'The Annual Catalogue, 1899-1900,' affords the opportunity for noting many interesting particulars concerning the course of instruction in architecture followed at the Massachusetts Institute."

A column and a half of description of the work of this course follows.

The following extracts are from circulars recently issued by the Institute: —

NEW OPTIONS OF THE COURSE IN CHEMISTRY

A new and systematic series of options has been recently introduced into the Course in Chemistry by the Faculty, with the purpose of enabling students to prepare themselves more thoroughly than has been hitherto possible for the important special lines of chemical work in which a considerable demand for the services of Institute graduates has been shown by experience to exist. These options have, however, in all cases been developed in accordance with the principle that the specialization should not be carried to such an extent as to prevent the student from acquiring a thorough training in all the important branches of chemistry, sufficient even to enable him to take a position in a line differing from that for which his option has specially prepared him. Thus the time required for the various options has been gained, not by eliminating any of the general instruction in analytical,

theoretical, industrial, or organic chemistry, but by transferring certain specialized courses now taken by all students from the list of required subjects to the appropriate options. . . .

Most of the graduates of the Course in Chemistry who occupy positions in manufacturing establishments are called upon to superintend the running of machinery and to take charge of various mechanical operations. Option I., which includes a considerable amount of instruction in mechanical engineering and drawing, is strongly recommended as furnishing an adequate preparation for students who desire to fit themselves for such positions, provided they have a sufficient aptitude for mathematics and drawing to make probable the successful completion of the work which the option requires. The courses in mechanism and valve gears (each accompanied by drawing), and the course on engines and machines, are especially adapted for the students of the Course in Chemistry, and are designed to give such a knowledge of fundamental principles as will enable them to understand the simpler forms of machinery, to interpret mechanical drawings, and to furnish an adequate foundation for further development in the same lines. It may be added that the students taking this option receive an essentially different training from that acquired by those in the Chemical Engineering Course, the former devoting by far the larger proportion of their time to chemical and the latter to mechanical engineering subjects.

Option II. comprises the laboratory courses on all the special branches of technical analysis; namely, those on water, air, and food analysis, sugar analysis, and proximate analysis, as well as courses in biology, microscopy, and geology. The option is especially of value to those who desire to fit themselves for the general practice of analytical chemistry, and for positions as chemists in such laboratories as those of railroads or manufacturing establishments. Though less satisfactory as a general preparation for the manufacturing side of chemistry than the preceding option, it may be taken by students who desire to occupy purely chemical positions.

Option III. is intended for students wishing to prepare themselves

for positions connected with the purification of water and sewage, with the examination of milk, butter, and other food supplies, with fermentation and food-preserving industries, or with other industries in which bacterial action plays an important part. About ten per cent. of the former Institute graduates in chemistry occupy such positions.

Option IV. is intended for those who desire to become chemists of metallurgical works or, after more experience, superintendents of such establishments. About ten per cent. of the Institute graduates in chemistry are now engaged in metallurgical work.

Option V. forms a complement to the Course in Physics, and is intended to meet the needs of the same class of students; namely, of those who desire to become teachers, especially in higher institutions, or to fit themselves for scientific research. It differs, however, markedly from the Course in Physics in that by far the larger portion of the work is on the chemical instead of the physical side. Nearly one-fourth of the chemical graduates are engaged in teaching or research, and for the larger proportion of these there is little doubt that this new option would have proved most satisfactory preparation.

COURSE IN ELECTRO-CHEMISTRY

The rapid advances now being made in the applications of electricity in chemical and metallurgical industries call for a training which has not hitherto been fully provided in the courses in Electrical Engineering, Physics, or Chemistry, as given at the Institute or elsewhere. The problems arising in these arts require for their solution the combined training of the physicist, the chemist, and, to a less degree, that of the engineer.

To meet the wants of students desiring to prepare themselves for entrance into the various electro-chemical industries, the Institute has decided to establish a course of study leading particularly to this end.

This Course, which has been established as an "Option" of the Course in Physics, comprehends, first, an extended consideration of electricity and electrical testing, together with those portions of

electrical engineering which are especially related to machinery employed in electro-chemical work; second, a thorough course in chemistry, including analytical, industrial, organic, and theoretical chemistry; and, third, a detailed study of the theory of electro-chemistry and its industrial applications.

The option in electro-chemistry aims to provide the education requisite for the investigation of the many new problems which the development of novel processes is certain to bring forth, and also to impart the professional skill requisite for the installation, testing, and operation of apparatus and machinery by which electrical energy is applied in chemical, metallurgical, and allied processes. The instruction given, moreover, is of such a broad character, particularly in electricity and chemistry, that a student completing this option should be well prepared to undertake various lines of electrical or chemical work other than electro-chemistry.

THE GRADUATES

THE TECHNOLOGY CLUB

Summer for the Technology Club is always more or less of a quiet season. The Institute is closed except for the few summer courses which are over by the first of August. There are fewer of the instructing staff happening in; but a number of the alumni about Boston avail themselves of the hot weather lunches which are served daintily and in a cool dining-room. At the time of the entrance examinations the candidates for examination were invited to use the dining-room of the club. Not many of them, however, accepted the invitation.

When the season of "smoke talks" begins, the members who are unable to use the club except on these evenings will see with what pains the House Committee has freshened the appearance of the whole house with paint, new wall paper, and carpets where needed. An interesting fact attached to this is that the paper and

carpet are the products of Institute men. Just as at the time of the last Presidential campaign, the election returns will be received at the club-house on the evening of election day.

Appended is a reprint of the circular mailed to club members, which contains a list of the "smoke talks" already given in the "common room."

THE TECHNOLOGY CLUB

BOSTON, June, 1900.

In the belief that many Institute men—including even members—do not appreciate how much the Technology Club does for those who use it, the following reminder of the opportunities for pleasure and profit is sent:—

A homelike house, with open fires, books, comfortable furnishings, and a charming outlook upon the Institute grounds.

Table d'hôte breakfast (7 to 9 A.M.), lunch (12 M. to 2 P.M.), and dinner (6 to 8 P.M.) every day in the week at reasonable prices. "Extras," if ordered in advance, will be served at an additional cost. To all meals, members may bring friends (subject to the usual club rules relative to guests), and on the following days may bring ladies: *Sundays* to dinner and supper, *Mondays* and *Wednesdays* to dinner, and *Saturdays* to lunch and dinner.

Moreover, anything from a sandwich to a substantial meal may be obtained at any hour between 7 A.M. and 11 P.M. by application to the steward. Attention in this connection is called to the fact that Welsh Rarebits will be served, upon notice to the steward, in the evening after the theatre. Special arrangements will be made with members desiring to take all their meals at the club or with groups of members wishing to lunch or dine together.

Comfortable bedrooms at moderate prices. Owing to the favorable location of the house, these are unusually cool in summer. While it is well to make application for these rooms in advance, it is generally possible to secure one without previous notice.

The standard American and foreign periodicals to the number of about fifty. Ample facilities for correspondence.

Long distance telephone; free to members within the so-called Boston Division.

A combined billiard and pool table. Billiard and pool tournaments. Opportunities for playing cards, chess, etc. Whist evenings.

Cigars, cigarettes, and "soft" drinks of all kinds on sale at all times. Smoking is allowed in all parts of the house.

A convenient, dry shed for bicycles.

Excellent facilities for the giving of class and other dinners, with bills of fare equal to those of the leading hotels.

Rooms for the holding of committee meetings on matters in any way connected with Institute affairs.

"Talks" at intervals of about two weeks during the Institute session. These talks are held generally on a fixed day of the week; and smoking is permitted, excepting at the two or three to which members are privileged to bring ladies. With rare exceptions, members may bring men guests to all these talks. They are of a high order of interest, and a majority of them are illustrated with lantern pictures (see list). A lunch is always served after the talks.

Special opportunities at the "Riverside Recreation Grounds."

Information in detail regarding the club, copies of notices, membership application blanks, etc., may be obtained at the club-house or by writing to WALTER HUMPHREYS, secretary, 71 Newbury Street, Boston, Mass.

From June 15 to September 15 the rules regarding the admission of guests are suspended, and members may bring friends, whether ladies or gentlemen, to lunch or dinner whenever they please.

LIST OF TECHNOLOGY CLUB "TALKS" AND OTHER MEETINGS, 1897 TO 1900

Those having the title in italics were illustrated by the stereopticon.

1897.

- Mar. 16. Professor E. S. Morse, "*Japan and the Japanese.*"
- Mar. 27. M. I. T. Glee Club.
- Apr. 9. Dr. F. H. Williams, "*X-Rays.*"
- Apr. 16. Reception to Hon. C. D. Wright.
- Apr. 21. Reception to Juniors and their friends.
- May 7. Professor W. T. Sedgwick, "*Famine and Plague in India.*"
- May 14. M. I. T. Banjo and Mandolin Clubs.
- May 21. Bohemian Orchestra.
- Oct. 22. Reception to Class of 1898.
- Oct. 29. Herbert Putnam, "Some Famous Thefts from Libraries."
- Nov. 8. Reception to President Crafts.
- Dec. 5. F. Marion Crawford, "The Original Mr. Isaacs."
- Dec. 10. Bohemian Orchestra.
- Dec. 17. Chas. W. Hubbard, "*Canoeing on English Rivers.*"

1898.

- Jan. 2. String Quartette, Chamber Music.
 Jan. 7. Dr. G. Byron Gordon, "*Ruins of Central America.*"
 Jan. 21. W. L. Underwood, "*Birds, Animals, and Odd New England Characters.*"
 Jan. 28. Dr. E. E. Hale, "The Topography of Old Boston."
 Feb. 19. Reception to ladies in honor of the Thirty-third Anniversary of the Opening of the Institute.
 Mar. 2. President T. C. Mendenhall, "*Alaska.*"
 Mar. 12. M. I. T. Glee Club.
 Mar. 18. H. A. Miller, "*Metropolitan Water Supply.*"
 Mar. 26. Subscription Concert, M. I. T. Glee, Banjo, and Mandolin Clubs.
 Apr. 8. Arthur T. Hopkins, "*Jamaica.*"
 Apr. 14. Hon. Carroll D. Wright, "The Workingman's Complaint against the Courts."
 Sept. 26. Hiram S. Maxim, "*Inventions in Connection with Fire-arms.*"
 Oct. 26. Excursion to Metropolitan Water Basin.
 Oct. 27. Rev. E. G. Porter, "Evolution of the Modern Spaniard."
 Nov. 5. Professor F. H. Giddings, "The Philippine Question."
 Nov. 11. Paul du Chaillu, "*The African Forest.*"
 Nov. 18. C. Howard Walker, "*The Trans-Mississippi Exposition.*"
 Dec. 6. Prof. C. E. Fay, "*The Canadian Rockies.*"
 Dec. 16. Professor J. O. Sumner, "*National Character as illustrated by Ancient Sculpture.*"
 Dec. 20. Edward Gilchrist, "China and the Modern World."

1899.

- Jan. 27. G. E. McQuesten, "*Japan.*"
 Feb. 3. Stereopticon Pictures and Long Distance Telephone Conversation with North-western Association Alumni Banquet.
 Feb. 20. Dinner to D. C. French. (Speeches by Mr. French, President Crafts, President Drown, Professor Charles Eliot Norton, and Mr. C. H. Walker.)
 Mar. 3. Gen. Charles H. Taylor, "Modern Journalism."
 Mar. 10. Professor A. E. Burton, "*Gruyère.*" [Ladies invited.]
 Mar. 23. Professor Charles E. Munroe, "Smokeless Powder."
 Mar. 31. W. L. Underwood, "*Hunting with a Camera.*"
 Apr. 7. Subscription Reading by Mrs. Erving Winslow, and Concert by M. I. T. Glee, Mandolin and Banjo Clubs.
 Apr. 17. Joseph Earle Stevens, "*The Philippine Islands.*"

1899.

- May 5. Leonard Metcalf, "*Puerto Rico.*"
May 15. Professor S. H. Woodbridge, "The Great Lottery Fight."
Nov. 3. Howard A. Carson, "*Some Things seen by an Engineer during an Excursion in Egypt.*"
Nov. 17. Edwin S. Crandon, "Old Boston, England."
Nov. 24. Dr. Henry A. Wolff, "The Transvaal and the Present Crisis."
Dec. 7. Mrs. Mabel Loomis Todd, "*In Ainu Land with an Eclipse Expedition.*" [Ladies invited.]

1900.

- Jan. 3. Professor Arlo Bates, "Anglo-Saxon Natural Science."
Jan. 19. Professor D. R. Dewey, "Visit to the George Junior Republic."
Feb. 9. Lieutenant Colonel Butler Ames, "Experiences during the Spanish War in Porto Rico."
Feb. 23. W. L. Underwood, "*Children of the Woods.*" [Ladies invited.]
Mar. 2. Colonel Curtis Guild, Jr., "Reminiscences of the Spanish War in Cuba."
Mar. 9. Louis F. Cutter, "*A Month in Tunis and Algeria.*"
Mar. 16. Gelett Burgess, "Some Essays in Enthusiastic Journalism."
Mar. 30. Professor D. P. Bartlett, "*On Horseback through the Yellowstone Park.*"
Apr. 14. Col. H. C. Cochrane, U.S.M.C., "Personal Reminiscences of the Battle of Guantanamo."
May 8. Edwin F. Atkins, "*Cuba.*"
June 5. Reception to President-elect Pritchett.

NEWS FROM THE CLASSES

1868.

PROF. R. H. RICHARDS, *Sec.*

Mass. Inst. of Technology, Boston.

Robert H. Richards is just finishing the seventh year which he has devoted to writing a book on ore-dressing. The first nineteen chapters are in the hands of the printer or are ready to go. The remaining two chapters he hopes to finish within a month. The subject has presented rather peculiar difficulties, as classification of operations can only be done to a limited extent; and, in consequence, a great number of individual operations have to be described and discussed separately. The writing of this book has absorbed so much energy that other demands of the department have had to yield to it. Professor Richards expects to be able now to devote himself to bringing up these other lines to the development they rightly claim.

1873.

SAMUEL E. TINKHAM, *Sec.*

City Hall, Boston.

Frank W. Very has been appointed special agent to the

United States Weather Bureau
at Rock Point, Md.

1875.

E. A. W. HAMMATT, *Sec.*

53 State Street, Boston.

Wilfred Lewis is now president and engineer of the Tabor Manufacturing Company, 18th and Hamilton Streets, Philadelphia, Pa.

1877.

RICHARD A. HALE, *Sec.*

Lawrence, Mass.

F. W. Wood is president of the Maryland Steel Company, and has been instrumental in developing the plant at Sparrow's Point, Md., to its present condition. He has various Tech. men of other classes associated with him.—E. Grover is engaged in landscape engineering at East Walpole and surrounding country.—J. E. Hardman, consulting mining engineer of Montreal, has just made a flying trip to Boston. He is contemplating opening an office in London. He has made many examinations of the Canada mines.—Herbert Jaques is

an active member of the Brookline Country Club, being connected with some of the committees, and is an expert golf player.—R. A. Hale, as chairman of the Lawrence Park Commission, is very busy with various matters pertaining to shade-trees, parks, etc., which are under the general supervision of the commission. There are in Lawrence about twenty-five Tech. men, and the subject of a branch club is being discussed.

1881.

FRANK E. CAME, *Sec.*

17 Place d'Armes Hill, Montreal, P.Q.

Frank G. Darlington has been spending the summer at Hyannisport, Cape Cod.—Dr. John Duff is recognized as one of Charlestown's leading physicians.—Governor Frank Rollins's "Home Week" was again a great success. Frank wants to be United States senator.—Of the graduates of the class, only seven remain bachelors.—Ira Abbott is at Andover, Mass., in engineering and supply business.—William R. Snead is now at Jersey City, still as general manager of the Snead Iron Works.

1882.

WALTER B. SNOW, *Sec.*

Watertown, Mass.

George F. Shepley is a member of the Board of Architects in charge of the design and construction of the buildings for the Pan-American Exposition to be held in Buffalo during the summer of 1901.—James E. Chapman, who is secretary and treasurer of the Neponset Land and Live Stock Company at Evanston, Wyo., is reported to have spent the summer in the East. His old home is at Canton, Mass.—George L. Heins has been appointed State architect of the State of New York.—George W. Mansfield is manager of the delivery department of the New England Electric Vehicle Transportation Company, Boston.—W. H. V. Rosing has been appointed to the newly created office of assistant superintendent of machinery of the Illinois Central. He was born in Cincinnati, Ohio, March 8, 1859. After leaving the Institute in May, 1880, he entered railroad service with the Illinois Central as machinist's helper at the old Weldon shops, Chicago. Ex-

cept for brief periods between 1891 and 1897, he has been with the Illinois Central until the present time. He was transferred to the draughting-room in April, 1882, and became secretary to the superintendent of machinery in September of the same year; chief draughtsman of the machinery department in January, 1884; and assistant master mechanic of the Chicago Division in April, 1890. After serving as mechanical engineer of the Grant Locomotive Works in 1892 and master mechanic of the First Division of the Denver & Rio Grande in 1894, he returned to the Illinois Central in 1897 as mechanical engineer, and took his present position on December 1 last.—Edward G. Gardiner has been this summer at the Biological Laboratory at Wood's Hole, of which he is one of the directors.—Mr. George T. Jarvis, who has been appointed general manager of the Wisconsin Central Railway, with headquarters at Milwaukee, began his railway career when sixteen years old, as an apprentice in the shops of the Pennsylvania Railroad. He next became a fireman, and then, in 1881,

took a course in civil engineering at the Institute. After leaving that school, he entered the operating department of the Philadelphia & Erie Road, and gradually rose in this branch of the railway service on various lines in the United States and Mexico, until in 1896 he was appointed receiver and general manager of the Louisville, Evansville & St. Louis Road.

1884.

DR. AUGUSTUS H. GILL, *Sec.*
Mass. Inst. Technology, Boston.

Miss Laura A. Linton is resident physician in the woman's department of the Rochester (Minnesota) Insane Hospital. She taught in the Minneapolis High School until 1895, when she left to accept the position of private assistant to Professor S. F. Peckham. Her work with him consisted largely of the analysis of asphalts, the results of which were published in the *Journal of the American Chemical Society*. In 1896 she commenced her course in the medical school of the University of Minnesota, taking her M.D. last June. Much of the time there spent she served as assistant in dif-

ferent departments.—Edward V. Sedgwick, formerly with the Mexican Central Railroad, is now a travelling mechanical expert with the Galena Oil Company of Franklin, Pa. When last heard from, he was at Arequipa, Peru.—The sixteenth annual directory has just been issued by the class secretary, with interesting notes from scattered members of the class, and a memorial of George H. Heywood, who died in May, 1898. Mention is made of a gift of an oak table to the Technology Club.—H. F. Baldwin is now chief engineer of the Chicago & Alton Railway, Monadnock Building, Chicago, Ill.—Alfred L. Fitch is in the construction department of Swift & Co., Union Stock Yards, Chicago.—C. O. Prescott has returned to Milton Academy as teacher of German and chemistry.—Theodore W. Robinson is general manager of the Illinois Steel Company, Rookery Building, Chicago, Ill.—Alfred Stebbins, Jr., whose present address is 46 Columbus Street, Newton Highlands, has recently been with Mr. Arthur F. Gray, mill engineer, 53 State Street, Boston. Since his return from San Francisco in

1891, Stebbins has been in the neighborhood of Boston, and during the past summer has been doing landscape work on an estate in Cohasset.

1885.

E. B. HOMER, *Sec.*

Mass. Inst. of Technology, Boston.

The class meeting of this year was held at the Puritan Club on May 26. Twenty-two members attended. The resignation of Arthur D. Little, the class secretary for the past five years, was accepted with many regrets and with a general expression of appreciation of the good services rendered to the Institute and the class.—J. M. Kimball was elected president for ensuing year, and E. B. Homer secretary for five years.—C. H. Bartlett is at present connected with the construction department at the Charlestown Navy Yard.—W. D. Fuller is in the signal service at Los Angeles, Cal.—“Ike” Litchfield is still with the Deering Harvester Company, Chicago, and writes, among other interesting items, that in the North-western Association other classes frequently

refer to '85 as the inaugurator of the new era at the Institute. — Sidney Williams has been appointed comptroller of the Delaware Valley & Kingston Railway Company, in addition to previous duties. — Henry Williams is working out a complicated problem in chemical engineering for the United States government. — The engagement is announced of Arthur D. Little to Miss Henrietta K. Anthony, of Boston. — Wedding cards have been received from Alfred L. Fuller.

1886.

PROF. ARTHUR G. ROBBINS, *Sec.*

Mass. Inst. Technology, Boston.

William F. Jordan is assistant engineer of the New York Central & Hudson River Railroad at Grand Central Station. — Professor E. F. Miller was married, September 11, to Miss Mary W. Reed, of Lexington, Mass. — H. B. Merriam is assistant engineer for the Chicago Great Western Railway at Des Moines, Ia. — E. J. Wilson is with the British American Corporation, 61 Beekman Street, New York.

1887.

EDWARD G. THOMAS, *Sec.*

89 State Street, Boston.

Helen Cooley Palmer is professor of chemistry at the New York Medical College and Hospital for Women, as well as physician and assistant surgeon to the New York Ophthalmic Hospital. — W. S. Thompson is assistant engineer of the Pennsylvania Railroad at Oil City, Pa. — Sidney Williams is general superintendent of the Pennsylvania Coal Company, Dunmore, Pa. — George F. Sever, formerly an instructor in Columbia University, has recently been appointed superintendent of electrical exhibits, Pan-American Exposition, Buffalo, N.Y. He has made the suggestion to the officials that the classes in electrical engineering from all the colleges in this country be invited to come to the Pan-American Exposition and inspect the electrical plant, which is to be the best equipped and the most extensive of any in the world.

1888.

WILLIAM G. SNOW, *Sec.*

4 Post-office Square, Boston.

A. F. Mead has become a member of the firm of A. &

O. W. Mead & Co., commission merchants, 36 North Market Street, Boston.—Messrs. Stone & Webster suffered considerable damage from fire, August 23. They have moved temporarily to 93 Federal Street, Boston.—B. R. T. Collins, with the Chicago Edison Company, married Miss Katherine Greer of that city, June 20. They reside at 4557 Oakenwald Avenue.—G. U. G. Holman became connected, in August, with the switch-board engineering department of the General Electric Company, Schenectady, N.Y.—S. C. Hathaway, Jr., is with Hathaway, Soule & Harrington Corporation, New Bedford, Mass.—Arthur W. Jones is manager of the Australian Electric Company in Melbourne.—Ivar L. Sjöström is treasurer of the Lawrence Dye Works Company at Lawrence, Mass.

1889.

WALTER H. KILHAM, *Sec.*

3 Hamilton Place, Boston.

Frank L. Pierce, late special inspector for the Factory Mutual Insurance Company of Boston, is now general manager of the Chelsea Jute Mills of Brooklyn, with offices at 346 Broadway,

New York City. Owing to the removal of Frank L. Pierce, our former secretary, to New York, our president, F. W. Hobbs, has requested W. H. Kilham to act as secretary until the next meeting of the class.—George C. Harding, who is established as an architect at Pittsfield, Mass., has designed a large number of country residences in the Berkshires.—C. B. Moore is prominent in yachting circles at Annisquam, Mass., and in his spare time has designed a number of half-raters which have proved among the fastest in their class.—Hollis French, with his partner, Allen Hubbard (Yale, '83), is designing the heating, ventilating, and electrical plant for the new Yale Memorial buildings at New Haven. The auditorium is to seat three thousand people, and the dining hall about twelve hundred. The building is to contain elaborate kitchens, laundry, and refrigerating plants, all of which are being designed by French & Hubbard. They also have on the boards plans for the construction of a plant to transmit 5,000 H. P. fifteen miles by electricity.—Charles B. Dodge is in the real estate business at

257 Washington Street, Boston. — E. V. Shepard is chief clerk of the U.S. Patent Office at Washington, D.C., with authority over nearly seven hundred employees. — Walter H. Kilham has recently rearranged his offices at 3 Hamilton Place, Boston. He has on his boards plans for a large school building and several residences in the vicinity of Boston. — W. G. Bixby, treasurer, S. M. Bixby & Co., manufacturers of shoe blackings at 194 Hester Street, New York, has been, with Mrs. Bixby, spending his vacation with his parents at Salem. — J. Lawrence Mauran has dissolved his partnership with Shepley, Rutan & Coolidge, with whom he has been connected since leaving the Institute, and has formed a new copartnership under the name of Mauran, Russell & Gardner, with offices in the Chemical Building, St. Louis. He has taken over the entire St. Louis practice of Messrs. Shepley, Rutan & Coolidge. Among other large buildings, he is designing the Carnegie Library for Sedalia, Mo. — '89's contribution to the Gymnasium Fund is now \$1,970. The amount is creditable, but it represents only a few subscrib-

ers; and many members of the class have not answered. It is hoped that each member of the class will feel it his duty to respond in some way, and maintain the record of the class. — F. W. Hobbs has been appointed by Governor Crane State trustee of the Lowell Textile School. The school — of which W. W. Crosby, '93, is principal — is finely equipped with machinery specially built for studying the manufacture of cottons, woollens, and silks, as well as dyeing and printing apparatus. There are five general courses, of three years each; namely, cotton manufacturing, wool manufacturing, designing (general course), chemistry and dyeing, and weaving. At the graduating exercises of the first class to leave the school, Mr. Hobbs delivered an address on "The Present Tendency toward Specialization in Textile Work in America, and Consequent Necessity for Textile Schools." — Arthur L. Davis is with the structural contracting department, American Bridge Company, 100 Broadway, New York, N.Y. — William S. Davenport is studying at Clausthal, Germany. — Alfred W. French is president of the French Oil

Mill Machinery Company, Piqua, Ohio.— Benjamin W. Guppy is bridge engineer, Maine Central Railroad, at 238 St. John Street, Portland, Me.— Jasper Whiting is travelling around the world for pleasure.— Harry H. Hunt is manager of the Tampa Electric Company, Tampa, Fla.— F. W. Ranno is engineer of maintenance of way, Southern Indiana Railway, Bedford, Ind.

1890.

GEORGE L. GILMORE, *Sec.*

Lexington, Mass.

Mr. Francis W. Dunbar and Miss Edith Vaughan Flanders were married Aug. 8, 1900, at Dover, N.H.— Knight C. Richmond is with Mr. T. P. Shelden, the architect, at Providence, R.I.— H. B. Burley has just recovered from a severe attack of typhoid fever. During his illness he was at the home of his brother-in-law, Dr. W. G. Curtis, also of the class of '90.— C. B. Beasom is at present inspecting the mills and factories around Boston.— We are pained to announce the death of our classmate, George D. Chapman, who died May 31 at Woodbridge, N.J. Mr.

Chapman had been in poor health for the past year, but his illness had not been regarded as serious until within a few hours of his death. For five years he had been with the Fitchburg Machine Works; but about a year ago he left to accept a position with the New York Ship Building Company of Camden, N.J., where he had a bright prospect before him. Mr. Chapman will be very much missed at our future reunions, as he was one of the few who could always be depended upon to be present at all class gatherings and was always ready to do his full share financially.— Joseph B. Baker is with the Consulting Machine Specialty Company, 150 Purchase Street, Boston.— Elwood A. Emery is a vocal teacher at 51 St. Stephen Street, Boston.— John R. Hall is at Clear Lake, Minn.— Philip M. Hammett has become assistant superintendent of motive power, Boston & Maine Railroad.— Schuyler Hazard has become division engineer, New York Central & Hudson River Railroad, at Jersey Shore, Pa.— Clarence G. Norris is superintendent of streets at Hyde Park,

Mass.—E. S. Walker has been appointed assistant professor of civil engineering at the Pennsylvania State College, State College, Pa.

1891.

CHARLES GARRISON, *Sec.*

Lexington, Mass.

J. G. Barri is at Westfield, N.J.—L. A. Dunham is consulting engineer of the Meyer, Clarke, Rowe Mines Company, Kansas City, Mo.—Henry A. Fiske is superintendent of surveys, Underwriters' Bureau of New England, 93 Water Street, Boston.—Morris Knowles is assistant engineer in charge of Testing Station, Improvement and Filtration of the Water Supply, Philadelphia, Pa.—Alexander W. Moseley is assistant professor of applied mechanics at the Lewis Institute, Chicago, Ill.—Charles P. Wetherbee is assistant superintendent of the Bath Iron Works, Bath, Me.—The death of Arthur B. Stoddard, August 31, is reported.

1892.

PROF. SEVERANCE BURRAGE, *Sec.*

Purdue University, Lafayette, Ind.

Mr. Walter M. Newkirk, of the Buhl Malleable Company

of Detroit, passed through Boston on his vacation, September 13, for the first time since 1893. He had made a trip across the Great Lakes, Lakes Champlain and George, to New York City and Phillipsdale, R.I. He reports seeing Mr. Packard at the latter place, where he is doing some dredging on the Seekonk River, as previously reported. Mr. Ober is government engineer and inspector on this work. Mr. Newkirk reports meeting Charles C. Milburn on the Hudson River boat bound for New York, and says that Mr. Milburn, who "had not changed a particle," was just returning from some mining work in the State of Washington. He also reports Mr. Kales as doing a rushing business in Detroit.—B. P. Du Bois is paymaster in the United States navy at the New York Navy Yard.—William R. Kales is of the Whitehead & Kales Structural Contracting and Engineering Company, Detroit, Mich.—George H. May is chief chemist and works manager of the New York Leather and Paint Company.—George A. Merrill is with the New England Structural Company, East Everett,

Mass.—A. G. Pierce is technical engineer, direct currents, Edison Electrical Illuminating Company of Boston.—Frank C. Shepherd is assistant engineer, Street Department, city of Boston.—William C. Thalheimer is engineer for Harrington & Robinson & Co., 272 Franklin Street, Boston.—Francis Walker has been appointed professor of political and social science at Adelbert College, Cleveland, Ohio.—Murray Warner is in China, representing the American Trading Company of New York.

1893.

FREDERIC H. FAY, *Sec.*

60 City Hall, Boston.

Percy Holbrook Thomas and Miss Isabella Mary Patten, of Newton Centre, Mass., were married at the First Baptist Church of Newton, September 6, 1900. Mr. and Mrs. Thomas will reside in Pittsburg, Pa., where he is connected with the Westinghouse Electric and Manufacturing Company. Thomas will be remembered as the man whose scholarship record was the highest ever made at the Institute up to 1893; and the knowledge that

this record would probably never be surpassed may have caused the Faculty shortly after to abolish "Honors" entirely. At any rate, the brilliant student of to-day can aspire to nothing higher than a "Credit." It could not be said of Thomas that he was a "grind" in the narrow sense, however. In the fall of 1892 he surprised us all by his good work on the 'varsity football team, where he played end in all but one of the games. His brother, J. W. Thomas, '95, was captain; and '93 was represented on that team by Abbott, Andrews, Dearborn, Taintor, P. H. Thomas, Simonds, and Wardner. We recall with pride the fact that the team won eight of the eleven games played, being defeated only by Harvard 'varsity, Amherst (one game), and Cornell. Thomas filled very creditably the part of statistician in '93's Class Day exercises. He is a member of the Delta Upsilon fraternity. The class will wish for him a future as bright as his past record has been brilliant.—Orton W. Albee is one of the patentees of the Baldt anchor, a new stockless anchor made of cast steel, which

is superior to the common type of anchor in that both flukes, instead of one, grip the bottom, thus giving much greater holding power for the same weight of metal. In construction the anchor is exceedingly simple, consisting of but two principal castings, the stem and the flukes, which fit together in a ball and socket joint that, in spite of wear, cannot get out of order. These anchors have been made in a number of sizes, ranging from 100 pounds to 14,000 pounds' weight, and are in use on ships of almost all maritime nations. The United States government has placed them on twenty-two torpedo boats, two light-house tenders, two revenue cutters, and the large army transports "Crook" and "Thomas." Baldt anchors are to be found on most of the steam merchant vessels built during the past three years on the Atlantic and Pacific coasts and the Great Lakes. They are made by the Baldt Anchor Company of Chester, Pa., of which company Albee is consulting engineer. A testing machine of 400,000 pounds' capacity has recently been built by this company to pull anchors according to Lloyd's

Agency tests. The company has agencies in Canada, England, Holland, Russia, and Japan.—W. H. Graves, treasurer of the Grueby Faience Company, has just returned from Paris, where his company's exhibit of Grueby pottery won a gold medal. This high recognition of a Boston product is all the more gratifying as the pottery is a new departure in ceramic art, and has been entirely developed within the last three years.—S. P. Waldron, for some years assistant engineer at the Keystone Bridge Works of the Carnegie Company at Pittsburgh, Pa., is now connected with the Eastern Bridge and Structural Company of Worcester, Mass.—Walter I. Swanton, formerly bridge inspector on the Boston & Albany Railroad, has been appointed naval inspector and stationed at the Norfolk Navy Yard, Portsmouth, Va.—Wallace C. Lambert has resigned his position of principal assistant to J. R. Worcester, structural engineer, 53 State Street, Boston, and is now with the New England Structural Company as assistant engineer at their Boston office.—Early in July, F. F. Skinner and

H. R. Kimball, both of them '93 men living in Boston, sailed from New York on the "Potsdam" of the Holland-America Line for a three months' European trip. They landed in Rotterdam, and were to visit Holland, Germany, Switzerland, and France, returning by way of England, Scotland, and Ireland. — F. W. Fabyan is a member of the Manchester Yacht Club and owner of the twenty-five-foot yacht "Flirt," which won considerable distinction the past summer by her remarkably fast sailing. Fabyan is a member of the firm of Bliss, Fabyan & Co., Boston, and has a summer residence at West Manchester, Mass.—At the Walker Building last September, Charles L. Norton gave exhibitions of the lighting effects of various types of ribbed and prismatic glass, describing the results of the experiments in this field made by him during the past four years. He demonstrated that by the intelligent use of such glass the gain in intensity of the light in the farther half of a room from forty to sixty feet deep is from ten to twenty fold, while the well-lighted area throughout such a room may easily be

trebled or quadrupled. The glare of light near a window may be avoided without darkening the room by shades. Norton's demonstrations showed that this glass is particularly suited to use in school-rooms and factories, in which latter especially the absence of shades and lamps will greatly lessen fire risks.—Frederic W. Baker is with the New York Ship-building Company, Camden, N.J.—Charles N. Cook is president of the Silver Spring Bleaching and Dyeing Company, Providence, R.I.—Carleton E. Davis is resident engineer of Cedar Grove Reservoir, Department of Water, Newark, N.J.—Frederick W. Hadley is superintendent of Power Plant, Boston Terminal Company.—Edward M. Hagar succeeds Jasper Whiting, '89, as manager cement department, Illinois Steel Company.—Harry M. Latham is with the American Steel and Wire Company, Worcester, Mass.—J. Ramsey Speer, formerly general superintendent of the Shoenberger Works (Pittsburg) of the American Steel and Wire Company, has resigned from that company to become a member of J. R. & J. McK.

Speer Company, contractors for iron and steel products, coal, and coke. Speer is now located in the Empire Building, Pittsburg, Pa.—Winthrop L. Tidd is with Lockwood, Green Company, 93 Federal Street, Boston, Mass.—George L. Walker is of the firm of Walker, Stidham & Co., Civil Engineers, New York, N.Y.—Frederic A. Wallace is master mechanic, Pacific Mills, Lawrence, Mass.—S. Edgar Whitaker is general manager of Portland & Yarmouth Electric Railway Company, Portland, Me.

1894.

S. C. PRESCOTT, *Sec.*

Mass. Inst. Technology, Boston.

George E. Barstow is designer for the Thompson Electric Consulting Company, Lynn, Mass.—Lewis S. Greenleaf is with the American Bell Telephone Company, Boston.—Frank W. Lovejoy is manager of the Kodak Park Works, Eastman Kodak Company, Rochester, N.Y.—V. A. Mayer is in telephone installation work, Pike Building, Cincinnati, Ohio.—Clarence D. Pollock and George A. Taber are assistant

engineers with the New York Rapid Transit Company, 13 Astor Place, New York, N.Y.—Walter O. Scott is inspector of milk, Providence, R.I.—Albert B. Tenney is secretary and manager of the Suburban Gas and Electric Company, Revere, Mass.

1895.

E. H. HUXLEY, *Sec.*

29 Hampshire Street, Camb'port, Mass.

Azel Ames, Jr., is supervisor of tracks, New York City.—Ernest F. Badger is chemist of the Rhode Island State Board of Health, 48 Weybosset Street, Providence, R.I.—Walter N. Crafts is superintendent of the Pittsburg Steel Foundry, Glassport, Pa.—Francis C. Green is general superintendent, Consolidated Car Heating Company, 413 N. Pearl Street, Albany, N.Y.—John H. Gregory is assistant engineer, Improvement, Extension, and Filtration of Water Supply, Philadelphia, Pa.—E. Lawrence Hurd is with the United Shoe Machinery Company, 205 Lincoln Street, Boston, Mass.—John D. J. Moore is general manager, Clayton Fire Extinguishing and Disinfecting Company, 11

Broadway, New York, N.Y.—Arthur F. Nesbit is associate professor of physics and electric engineering at New Hampshire College.—Walter F. Stevens is with the General Electric Company, Schenectady, N.Y.—William E. Swift is assistant engineer, New York Rapid Transit Railroad Commission.

1896.

F. E. GUPTILL, *Sec.*

71 Newbury Street, Boston.

Louis Shepard Morse was married to Blanche Lucille Gipe on Thursday, June 7, at York, Penn. At home after August 1, West King Street.—Mr. and Mrs. Edward F. Litchfield, of Lynn, Mass., announce the marriage of their daughter, Martha Towas, to Mr. John Gurney Callan on Wednesday, July 25. At home, Wednesday evening, September 19, at 23 Perkins Street, Lynn.—Henry Gardner is assistant to chief draughtsman, motive power department, Boston & Maine Railroad.—Edward B. Gardner, Jr., is with the National Steam Economizer Company, Springfield, Mass.—Joseph Harrington is agent for the

Nicaragua Company, Dayton, Ohio.—Joseph M. Howe is assistant engineer, maintenance of way, Houston & Texas Central Railway.—Paul W. Litchfield is superintendent Goodyear Rubber and Tire Company at Akron, Ohio.—John E. Lonngrén is general superintendent's private engineer, American Steel and Wire Company, Pittsburg, Pa.—George E. Merryweather has been in charge of the Brown & Sharpe exhibit at the Paris Exposition.—Charles K. B. Nevin is with Allen & Vance, architects.—Charles S. Newhall is mining engineer at the Brice Mines, Ontario.—Samuel T. Smetters is civil engineer with Scherzer Rolling Lift Company, Chicago, Ill.—Albert E. Smyser is assistant superintendent of the open hearth department, Duquesne Works of the Carnegie Company, Duquesne, Pa.—Charles H. Stone has been appointed second assistant State gas inspector of Massachusetts.—Bradley Stoughton is superintendent of the steel foundry at Derby, Conn.—William H. Thomas is with the Colonial Bleaching and Printing Company, Montreal.—Albert W. Thompson is superintendent of

machine shop, Amoskeag Manufacturing Company, Manchester, N.H.—Henry H. Tozier is chemist with the Nepera Chemical Company, New York, N.Y.—Charles E. Trout is with the Department of Docks and Ferries, New York, N.Y.—Hermann V. von Holst is head draughtsman with Shepley, Rutan & Coolidge, Chicago, Ill.

1897.

JOHN A. COLLINS, *Sec.*

55 Jackson Street, Lawrence, Mass.

Percy M. Smith was married on Wednesday, August 1, to Miss Ethel Burgess Torrey, of Rockland, Mass. Mr. Smith is with the Tremont and Suffolk Mills, Lowell.—Robert G. Hall was married on Tuesday, June 19, to Miss Josephine June Thompson, of Pueblo, Col.—Frederick L. Edmands is now in the Patent Office at Washington. There are not a few '97 men* in Washington; and it would be well if informal meetings, such as monthly dinners at some hotel, could be held regularly. The secretary feels that he cannot emphasize too strongly the desirability of the men keeping track of one another, keeping the class organization intact,

benefiting thereby not only themselves, but also Technology. It is through its alumni that a college becomes famous; and, if each alumnus severs all connection with his Alma Mater, of what use is he to her?—R. A. Bowen is at present on the road for the Buffalo Aniline Works, which company is making a strong bid for the dyestuff trade of this country, in competition with the large foreign corporations.—Argyle E. Robinson desires to announce to his friends that he has opened an office for the practice of architecture in Suite 622, 623 Oxford Building, 84 La Salle Street, Chicago.—The annual reunion and dinner of the class will be held some time in December, probably at Young's Hotel. Let us make this dinner a rousing one, abounding in plenty of the old-time under-graduate spirit. In case there be an intercollegiate torchlight parade this fall, in connection with the Presidential campaign, it is hoped that there will be an alumni division. If so, let every man in the vicinity of Boston appear. We all remember the good time in '96, and none of us is averse to another such evening.—Charles T.

Bramhall is chief draughtsman with the C. W. Hunt Company, West Brighton, N.Y.—Howard H. Burdick is chief inspector, Travellers' Insurance Company, Hartford, Conn.—Henry A. Clark is of the H. C. Clark & Son Machine Company, Lee, Mass.—Charles H. Eames is with Stone & Webster, 4 Post-office Square, Boston.—Mortimer Frank, M.D., is a physician at 233 Hampden Court, Chicago, Ill.—Walter A. Gleason is draughtsman with the Eastern Bridge & Structural Company, Worcester, Mass.—Owen H. Gray is superintendent of the Mutual Telephone Company, Des Moines, Ia.—Charles L. Hammond is with the Civil Engineer Department of Yards and Docks, at the Portsmouth Navy Yard.—Edmund B. McCormick is assistant professor of mechanical engineering at the Montana Agricultural College.—John S. Pechin is with the construction department, Illinois Steel Company, So. Chicago, Ill.—William S. Rhodes is assistant engineer, Street Department, Sewer Division, city of Boston.—John Taylor is with the General Electric Company, 200 Summer Street, Boston, Mass.—Lucius S.

Tyler is with the electrical department, Boston & Albany Railroad, South Terminal, Boston, Mass.

1898.

C.-E. A. WINSLOW, *Sec.*

Hotel Oxford, Boston.

W. A. Marshall was married on the 14th of June, at Duluth, to Miss Nettie Howe, of that city. Marshall is now superintendent of the Woburn factory of Baeder, Adamson & Co., with which firm E. F. Russ is still connected as a general salesman.—H. T. Smith's address is now 33 North Third Street, Reading, Pa.—A. S. Keene is the second of the '98 architects in Boston to open an independent office.—C. F. Drake was married during the summer, but neglected to inform the secretary of the fact.—J. H. Larrabee is in the office of the U.S. engineer, Winthrop Building, Boston, engaged as draughtsman.—L. J. Seidensticker returned during the summer from a successful trip to Cuba, made for the purpose of studying some chemical features of the cane-sugar industry.—C. H. Pease has left Leavitt's draughting-room, Cambridge, and is with

the Edison Electrical Illuminating Company on Atlantic Avenue.—H. L. Coburn has been with Lockwood, Green & Co., 93 Federal Street, Boston, since July. He is designing steam-power plants for cotton-mills. H. H. Sullivan is in the employ of the same firm.—C. H. Smith is with one of the large insurance companies, at 31 Milk Street, Boston.—F. H. Twombly is with the United Mills Export Company, 68 Broad Street, New York, N.Y.—I. H. Kaufman and M. E. Taylor are with the G. F. Blake Manufacturing Company, Third Street, East Cambridge, Mass.—C. A. Torrey has left Johns Hopkins, and opened an office in Philadelphia. His specialty, as a consulting chemist, is the analysis of waste products.—F. H. Jones is in business with his father, Frank H. Jones, in Rochester, N.Y.—E. R. Springer is with the Boston Elevated Railroad Company in their Atlantic Avenue office. Springer was married soon after he left the army.—H. Snelling is an organizer, and a member of the Executive Committee, of the Middlesex Hunt Club, which is introducing 'cross-country riding

in that county of Massachusetts.—R. W. Babson is actively interested in the projected electric railroad between Waverley and Concord, Mass., and has been working for its success in the various towns on its route during the autumn.—S. A. Hooker has left the locomotive works in Baltimore, and has gone into business with his father.—R. W. Pratt, Jr., who has been for more than a year in the engineer's office of the Massachusetts State Board of Health, made an elaborate study of the flow in various sections of the Metropolitan Sewerage System during the summer.—LeRoy H. Byam is an assistant engineer, Pennsylvania Division, New York Central & Hudson River Railroad, Jersey Shore, Pa.—Ira M. Chace, Jr., is a draughtsman, Wisconsin Division, Chicago & North-western Railway, Chicago.—Alvan L. Davis is an assistant superintendent, Ludlow Steel & Spring Company, Pompton, N.J.—Daniel W. Edgerly is a superintendent, Chilton Manufacturing Company, College Point, Long Island, N.Y.—Carl S. High is engaged in stock-raising at Arlington, Kan.—Charles S. Hürter is superintendent's assist-

ant, cyanide department, Cochiti Gold Mining Company, Bland, New Mexico.—Franklin M. Kellogg is with the Munson Steamship Company, 27 Williams Street, New York, N.Y.—Robert Lacy is an assistant engineer, Southern Railway, Washington, D.C.—Edmund C. Little is a draughtsman with Handy & Cady, Chicago, Ill.—Joseph J. Moebs is assistant engineer, Paving Division, State House, Boston, Mass.—George K. Newbury is with the American Shipbuilding Company, Cleveland, Ohio.—Edward W. Ritchie is a U.S. assistant engineer, Havana, Cuba.—William R. Strickland is chief engineer, Case Manufacturing Company, Columbus, Ohio.—Roscoe B. Whitten is an architect at Sydney, Cape Breton, N.S.—Ather-ton H. Tucker is with Stickney & Austin, architects, 50 Bromfield Street, Boston, Mass.—G. A. Hutchinson was in Boston for a few days in July *en route* from Milwaukee to Butte, Mont. A dozen of his classmates, mainly of the old Course II. gang, enjoyed an evening with him at the Technology Club; and the secretary exacted from the traveller a

pledge, of which the following letter is the fulfilment:—

ANACONDA, MONT., August 5, 1900.

“In view of your dire threat to write yourself a letter and sign my name to it, in case I failed to send you my impressions of Butte, I am forced, however unwillingly, to speak for myself. If I made you my spokesman, the matter, it is true, would be far more entertaining, but I should be sailing under false colors; and my old friends, cognizant of my native prosi-ness, could not be imposed upon. When I awoke the morning before I reached Butte, I was on a Great Northern sleeper in North-western Montana; and a more desolate, barren, and absolutely uninteresting prospect I never saw. The country is rather rough and broken, but practically destitute of vegetation of any sort, save here and there a little sage. The surface is gullied by the rain, and the hill-sides so steep as to resemble the slopes of a gravel bank more than anything else. As the train enters the valley of the Missouri, down which the Mon-tana Central Railway winds its way from Great Falls to Helena and Butte, the scene changes.

Some vegetation appears, and the town of Great Falls makes a respectable showing of trees and grass. After leaving Great Falls, we approached the Rocky Mountains closer and closer, and finally wound in and out at the foot of rocky masses looming up into the air hundreds of feet high, and without a bit of soil or of verdure to conceal or soften the rough outlines. Now and then the train shot through a tunnel, and finally entered the valley where nestles Helena, guarded on all sides by high mountains. Seventy-five miles more through similar scenes brings the traveller to Butte, now the principal city of the State, thanks to its rich copper mines, but twenty-five years ago not even on the map. I don't dare tell how many inhabitants there are. I think the number depends on who is telling the story. But it is safe to say that there are more than twenty-five thousand people and less than seventy-five. In the business centre the city looks quite metropolitan, with many pretentious brick blocks, though not a few ramshackle wooden buildings are interspersed. The outskirts contain many of the old log

cabins of the first settlers. There are plenty of pretty homes indicative of wealth and taste, but the curious feature is the lack of grass or even of weeds. In one or two yards good bits of lawn are to be seen, where evidently loam has been brought in and the seed carefully watered. But, generally speaking, the soil is too poor to grow anything, and nobody tries. A fine brick mansion, the most pretentious in town, has the small space between it and the sidewalk paved with cobblestones. Here and there, to shade a piazza, one sees an evergreen tree brought down from the mountain and stuck into the ground in front of the house. Cats there are and dogs galore, in spite of many statements to the contrary which I heard in the East. The city is built on a hill, and there are hills on all sides. The mines underlie the town, and one sees prospect holes and signs of mining operations everywhere. A family that I know of heard an unaccountable noise one night in their cellar, and upon investigation found that a portion of it had caved in as a result of mining operations below. The altitude is something over a mile

above sea level, and living expenses are higher yet. To put it moderately, seventy cents expended in the average town of the same size in the Eastern or Central State will buy as much as \$1 in Butte, perhaps more. Street-car men receive thirty cents per hour, and are now demanding thirty-five, with not less than ten hours' work. Miners earn \$3 or \$3.50 per day; and unskilled labor, in general, secures similar remuneration, while skilled mechanics can earn much more. In view of the high expense for living, and general unattractiveness of the place, which has practically nothing to offer in the way of amusement, good pay is necessary in order to make it an object for any one to stay. There seems to be in general an air of uncertainty, of indifference to the surroundings, as though people are here merely for what they can make, and hope to get away as soon as they can. These are first impressions, of course, and must be taken as such. As for me, I am located in Anaconda for the present, at the smelter of the Anaconda Copper Company. This town is twenty-six miles from Butte, is located in the

middle of a long, narrow valley, flanked with mountains on both sides, some of them so high that patches of snow are visible even now, the fifth day of August. It is pleasanter than Butte, since the soil is more fertile, and there are some green trees and green lawns; but for the most part it is untidy and unkempt. The sole industry is the copper smelting, and every business enterprise in town depends directly or indirectly on it for its very existence. An exceedingly short stay in this region suffices to impress me as never before with the quiet, serene beauty of the old New England towns with which I am familiar, and to which I hope some time to return if Dame Fortune smiles upon me."

1899.

WALTER O. ADAMS, *Sec.*

1776 Mass. Ave., North Cambridge,
Mass.

The marriage of Lawrence Addicks to Miss Mary M. O'Brien at Philadelphia, in June, 1899, is hereby very tardily announced to the class officially. Lawrence still keeps at the head of the class. He is in charge

of the testing laboratory, Raritan Copper Works, Perth Amboy, N.J.—The monthly class dinners will be held again this fall, the first one coming in October. Ample notice will be given as to time and place.—The subscriptions to the Walker Memorial Fund continue to come in. There are many men, formerly prominent in class and Institute affairs, that have not been heard from as yet. The committee looks to them for their usual aid.—The departure of Miles Sherrill for Leipzig, and his consequent resignation of the vice-secretaryship, deprives the class of an efficient officer. An election for his successor will be held at the annual class dinner.—Patch left for Beirut, Syria, in August. He is instructor in sciences at the Syrian Protestant College at that city.—John H. Adams is draughtsman with Peters & Rice, architects, Tremont Building, Boston.—Walter R. Bean is with the New York Ship-building Company, Woodbury, N.J.—Raymond F. Bennett is with the bridge department, New York, New Haven & Hartford Railroad, New Haven, Conn.—Harry A. B. Campbell is with the Baldwin Lo-

comotive Works, Philadelphia, Pa.—James K. Clark is draughtsman with the Keystone Electric Company, Erie, Pa.—Harvey M. Cushing is in the testing department, General Electric Company, Schenectady, N.Y.—Miss Henrietta C. Dozier is in the office of W. T. Downing, architect, Atlanta, Ga.—John A. Fleming is with the New York & New Jersey Telephone Company, Brooklyn, N.Y.—Arthur L. Hamilton is secretary and treasurer, Marinette Iron Works Manufacturing Company, Marinette, Wis.—Edward Herbert is with the Western Electric Company, Chicago, Ill.—Bernard Herman is with the engineer of bridges and building, Baltimore & Ohio Railroad, Baltimore, Md.—H. Philip James is assistant electrical inspector with the Factory Mutual Fire Insurance Companies, 31 Milk Street, Boston.—Almeron W. McCrea is with Warren & Wetmore, architects, New York, N.Y.—Harry S. Mork is chemist with the Cellulose Products Company, 28 Binford Street, Boston.—Worthington Palmer is in the office of George Cary, architect, Buffalo, N.Y.—William E. Parker is

with the Newport News Shipbuilding & Dry Dock Company, Newport News, Va.—George H. Perkins is instructor in mechanical drawing at the Lowell Textile School, Lowell, Mass.—William C. Phalen is professor of chemistry in the New Mexico School of Mines, Socorro, N.M.—Ernest A. Regestein is in the testing department, General Electric Company, Schenectady, N.Y.—Samuel B. Robertson is with the engineer of maintenance of way, Pittsburg Division, Pittsburg, Cincinnati, Chicago & St. Louis Railway.—William O. Sawtelle is instructor in science at the high school, Bangor, Me.—Edward W. Sibley is with the Sales Bleachery, Salesville, R.I.—Philip Stockton is treasurer of the Lowell Bleachery.—Jacob Stone, Jr., is with the Pittsburg Plate Glass Company, Ford City, Pa.—John L. Tufts is with the Laurel Hill Chemical Works, Laurel Hill, Long Island, N.Y.—Frederick A. Watkins is with the Western Electric Company, Chicago, Ill.

1900.

George O. Adams is chemist at the Experiment Station, Law-

rence, Mass.—Elbert G. Allen is a graduate student at the Massachusetts Institute of Technology.—Harrison E. Ashley, 947 Acushnet Avenue, New Bedford, Mass.—Charles Edw. Baldwin is chemist with Cellulose Products Company, Binford Street, Boston.—Morgan Barney is draughtsman in the office of H. C. Wintringham, naval architect and engineer, 32 Broadway, New York City.—Charles A. Barton, Jr., is in the engineering department of the New York Western Electric Company, 8 125th Street, New York, N.Y.—Robert S. Blair, Waterbury, Conn.—Ingersoll Bowditch is rodman for the Ludlow Manufacturing Company, Ludlow, Mass.—P. R. Brooks is with the Chicago, Burlington & Quincy Railroad, Beardstown, Ill.—Clarence C. Brown is with the American Bell Telephone Company, 15 Oliver Street, Boston.—Charles H. Brown is in the laboratory of the United States Leather Company, 30 Ferry Street, New York City.—Stephen P. Brown, Dover, Me.—F. D. Buffam is personal assistant to the head mechanical engineer of the Pennsylvania

Steel Works Company, 132 Locust Street, Harrisburg, Pa.—Edw. E. Bugbee is assistant in mining engineering at the Massachusetts Institute of Technology.—R. G. Burnham, “learner” in the power department of the Pennsylvania Steel Company, Steelton, Pa.—Marion L. Cade is private assistant to Mrs. Richards at the Massachusetts Institute of Technology.—Walter C. Chaffee is with J. D. Mason, architect, 85 Edmund Place, Detroit, Mich.—Aurin M. Chase is mechanical engineer of the Syracuse Chilled Plow Company, Syracuse, N.Y.—Percival C. Clow, draughtsman with the Eastern Bridge and Structural Company, Worcester, Mass.—William R. Collier is with M. W. McRae, consulting engineer, at 233 Equitable Building, Atlanta, Ga.—Franklin N. Conant is electrical engineer with the Bell Telephone Company, Antwerp, Belgium.—Harold S. Conant is at the Dow Academy, Franconia, N.H., as science and higher mathematics teacher.—Frederick H. Cooke is draughtsman for the Brown Hoisting and Conveying Machine Company of Cleveland,

Ohio.—Francis B. Dutton is with the Great Northern Paper Company of Millinocket, Me.—W. A. Edson is assistant superintendent in a piano factory at Cambridgeport, Mass.—Lewis Emery has been in Europe ever since he graduated.—Stanley G. H. Fitch is with the Elberton Oil Mills, Elberton, Ga., as refiner.—George B. Ford is a fifth year student at the Institute.—Charles M. Fosdick is assistant in civil engineering at the Massachusetts Institute of Technology.—Stephen F. Franklin is a graduate student, Massachusetts Institute of Technology.—George C. Gibbs is draughtsman for the Brown Hoisting and Conveying Machine Company, Cleveland, Ohio.—Milton W. Hall is a student in the medical department of the University of Illinois, Evanston, Ill.—Dean Hinman is assistant to the city engineer of Taunton, Mass.—Robert M. Hopkins is assistant engineer of the Bay Counties Power Company of San Francisco, Cal.—Frank N. Horton is draughtsman with the Lockwood, Green & Co. mill engineers, 93 Federal Street, Boston.—Charles C. Johnson

is with the Boston Transit Commission, 20 Beacon Street, Boston.—Henry D. Jouett is inspector of bridge erection for the New York Central & Hudson River Railroad, Utica, N.Y.—Leigh S. Keith is with the engineering department of the New York Telephone Company, 18 Cortlandt Street, New York, N.Y.—Arthur I. Kendall is a chemist at Ciriclar, La.—Herbert O. Keay is with the Nicholson File Company, Providence, R.I.—Grace Langford is at Wellesley College as instructor in physics.—Lewis M. Lawrence is teacher of drawing at the Mechanic Arts High School, Belvidere Street, Boston, Mass.—Robert H. Leach is a mining engineer at South Mountain, Idaho.—Edith Liliencrantz, 359 Telegraph Avenue, Oakland, Cal.—Robert R. Lingley, with the Whitlock Coil Pipe Company, Elmwood, Conn.—Francis X. McGowan, with the Western Electric Company of New York City.—S. M. Manley is with the Silver Spring Bleaching and Dyeing Company, Providence, R.I.—D. E. Maxfield is assistant in the testing department at Watertown Arsenal.—Arthur C.

Melcher is private assistant to Dr. Whitney at the Massachusetts Institute of Technology.—Charles Van Merrick is draughtsman with the New York State Canal Survey, Syracuse, N.Y.—George B. Moody is draughtsman for the Newport News Company, Newport News, Va.—H. L. Morgan is consulting engineer in the New York Telephone Company, New York City.—Walter A. Moulton is with the Illinois Steel Company of Joliet, Ill.—Newitt J. Neall is with the Westinghouse Electric and Manufacturing Company, East Pittsburg, Pa.—H. E. Osgood is assistant to master mechanic and chief engineer at the Upper Pacific Mills, Lawrence, Mass.—L. D. Peavey is with the New England Structural Company, Everett, Mass.—Thomas D. Perry, A.B., is assistant in the mechanical department of the Library Bureau, Boston, Mass.—Paul L. Price, graduate student, Massachusetts Institute of Technology.—John L. Porter, draughtsman, Wall Street, New York City.—Walter L. Rapp is with George W. Rapp, architect, Johnston Building, Cincinnati, Ohio.—Arville C. Redman is

in the engineering department of the Sewer Division, Washington, D.C.—Chester A. Richardson, Pelham, N.H.—E. H. Ritcher is assistant engineer at the Lower Pacific Mills, Lawrence, Mass.—George E. Russell is an assistant instructor at the Massachusetts Institute of Technology.—W. W. Sanders is superintendent of the Victoria Chemical Works, Chicago Heights, Ill.—Lewen F. Searle is in maintenance of way department of the New York Central & Hudson River Railroad, New York City.—Kenneth Seaver is in the office of the chief engineer of the Pennsylvania Company, Pittsburg, Pa.—Frederick W. Snow is a mining engineer at Rishenbar, Ariz.—Frederic W. Southworth is draughtsman with H. A. Phillips, architect, 120 Tremont Street, Boston.—W. Leonard Stevens is assistant in mining engineering at the Massachusetts Institute of Technology.—Lewis Stewart is with Charles A. Platt, architect, 107 E. 27th Street, New York City.—Henry H. Sullivan, draughtsman in machinery department of Lockwood, Green & Co., mill en-

gineers, 93 Federal Street, Boston.—Russell Suter is in the office of the city engineer of Cambridgeport, Mass.—Harry M. Thayer is with the Interstate Cotton Oil Company, Augusta, Ga., as refiner and chemist.—Clinton D. Thurber is draughtsman with the bridge and construction department of the Pennsylvania Steel Company, Harrisburg, Pa.—Percival E. True is chemist with the Bowker Fertilizer Company, Elizabethport, N.J.—Warren C. Tudbury, in maintenance of way department, New York Central & Hudson River Railroad, New York, N.Y.—Emil F. Vogel is in the crane department at the Case Manufacturing Company, Columbus, Ohio.—Arthur C. Walworth, Jr., steam engineering, 100 Pearl Street, Boston.—Frank D. Warren is with Dean & Main, mechanical and mill engineers, 53 State Street, Boston, Mass.—William H. Wedlock is with the Sewer Division of the Boston Street Department, 30 Tremont Street, Boston.—Percy R. Ziegler is with the Western Electric Company, 57 Bethune Street, New York City.

REVIEWS

RAILROAD CURVES AND EARTHWORK

BY C. FRANK ALLEN, S.B., M. Am. Soc. C.E., Professor of Railroad Engineering in the Massachusetts Institute of Technology. New York: Spon & Chamberlain.

For logical arrangement, clearness of statement, and conciseness of demonstration, this little book is a model of its kind. The nomenclature is simple and convenient, the figures clear, and the typography excellent. While the book was prepared and primarily intended for the use of engineering students, it contains much of interest and value to engineers generally, not only in the method of treatment, but also in new material.

The subject opens with a discussion of the reconnoissance and the preliminary and location survey. Then follow chapters on simple, compound, and reverse curves, the treatment of compound curves being novel and much simpler than that adopted by previous writers. The chapter on parabolic curves, both horizontal and vertical, will be found of service to the landscape engineer in staking out roads, paths, etc., where instrumental precision, except as to grade, is not required. The chapters on turnouts, Y tracks, and crossings, contain many new demonstrations.

The "cubic parabola" is suggested as a convenient spiral easement curve, which approximates the desired "curve of constantly and uniformly changing radius," and its functions are developed. Its use is recommended, however, only when the more convenient tables for spiral curves, such as those contained in Searles's "Railroad Spiral," are not at hand.

The latter half of the book is devoted to "Earthwork," which is admirably treated. It contains chapters on staking out, method of computing, special problems, tables, and diagrams of quantities, haul, and mass diagram. Of these chapters, those on staking out and method of computing earthwork, and on the mass diagram,

are worthy of special notice. The discussion of the six general methods of computing earthwork — particularly the development of the prismoidal formula and prismoidal correction — is excellent, bringing together, as it does in a concise manner, the several methods in common use and commenting upon their application. The mass diagram for determining haul, in its relation to cost, to the spoil bank and the borrow pit, is somewhat novel, and worthy of wider use.

While this book cannot, strictly speaking, be considered a field book, as it lacks the necessary tables of curves and logarithmic functions, it is a notable addition to the literature of railroad curves and earthwork, and a valuable supplement to other field books upon the subject. As compactness is essential, however, to the convenient use of any field book, it is to be hoped that the requisite tables may be added to the next edition of this admirable little book, and thus avoid the present necessity of carrying with it for use in the field a separate book of tables and constants. L. M.

THE COST OF LIVING AS MODIFIED BY SANITARY SCIENCE

BY ELLEN H. RICHARDS, A.M., S.B. (M. I. T. 1873), Instructor in Sanitary Chemistry, Massachusetts Institute of Technology. pp. 121. New York, John Wiley & Sons, 1899.

“The Cost of Living” is an intelligent analysis of the expenses of a household. It is not based upon the absurd sums of three and four hundred dollars per year for a family near our American cities. It is an investigation of the cost of existence of those who earn, as do the majority of the most intelligent American families,—students, professors, business men, and professional men,—from two thousand to five thousand dollars a year, as it is from this class that we may most confidently expect a great advance in the next generation in the knowledge of how to make the best use of life and how to get the greatest pleasure from the money expended. Chapters are devoted to Standards of Living; the Service of Sanitary Science in increasing Productive Life; Household Expendi-

ture and the Division between Departments according to Ideals; the House and the Rent, or Value and Furnishing; the Operating Expenses; Fuel, Light, Wages; Food; Clothing in Relation to Health; the Emotional and Intellectual Life; and the Organization of the Household. Two tables of budgets are given, one made up of typical ones, another made up of ideal ones. In these tables are given the per cent. of the total income which has been spent, on the one hand, for Food, Rent, Operating Expenses, Fuel, Wages, etc., Clothes, and Higher Life, Savings, Charity, etc., while, on the other hand, what should be spent for these items.

HYDRAULIC DIAGRAMS FOR THE DISCHARGE OF CONDUITS AND
CANALS

By CHARLES H. SWAN, Member, and THEODORE HORTON (M. I. T. '94), Junior Member, of the American Society of Civil Engineers. pp. 43; 16 diagrams. New York, Engineering News Publishing Company, 1899.

The long and responsible service of the late Charles H. Swan in connection with sewerage and other hydraulic works for the city of Providence, and later for the Metropolitan Sewerage Commission of Massachusetts; and the valuable, if less extended, experience of Mr. Horton,—have enabled these authors to prepare a book of great practical worth to hydraulic and sanitary engineers. It is intended to aid in the study of such sections of closed conduits and open canals as are commonly employed in sewerage, water supply, water power, and land drainage.

Of closed conduits, eight different types of cross-section are included; and open canals embrace both rectangular and trapezoidal forms, the rectangular being made, in fact, the basis of computation for the trapezoidal. The diagrams are framed upon the widely used formula of Ganguillet and Kutter, which Mr. Swan was the first engineer to put into graphic form for use in sewerage work. They are computed for a single coefficient of roughness ($n = .015$) for closed conduits and a single coefficient ($n = .025$) for open

canals; but, by the aid of a very convenient diagram of relative values, the discharge corresponding to any other probable coefficient can be obtained.

Diagrams Nos. 5 to 12 show the relative proportions of a variety of standard sections in use for large water-supply conduits and sewers, including those adopted for the Wachusett and new Croton aqueducts, several typical forms used in the Metropolitan sewers, such as the "Catenary," "Basket-handle," and "Gothic" sections, and the egg-shaped form, so frequently introduced in the combined system. They at the same time present curves showing the relative changes in water section, mean velocity and discharge, for all depths of flow. By referring appropriately to these diagrams, in combination with Nos. 1 to 4, the velocity and discharge for any one of the given forms, for any depth of flow, and for any probable size, grade, or character of surface, may be quickly ascertained with sufficient precision for practical purposes. The remaining diagrams deal with open rectangular and trapezoidal sections, and permit the easy determination for such forms of the same general results already mentioned for closed conduits.

Clear directions are given for dealing with any problem that may arise, as well as typical solutions. The diagrams have been ingeniously devised, are clearly printed, and should be of much service to engineers, both in designing new conduits and in determining hydraulic values for existing ones.

DWIGHT PORTER.

REPORT UPON NEW YORK'S WATER SUPPLY, WITH PARTICULAR REFERENCES TO THE NEED OF PROCURING ADDITIONAL SOURCES AND THEIR PROBABLE COST, WITH WORKS CONSTRUCTED UNDER MUNICIPAL OWNERSHIP

BY JOHN R. FREEMAN (M. I. T. '76). 587 pp. New York, Martin B. Brown Company, 1900.

This report ranks among the most valuable of recent contributions to the subject of water-supply engineering. It is in the form of a bound volume of nearly six hundred pages, which is not prepared for publication and sale, but is simply a special report to the

Comptroller of New York, Bird S. Coler, whose emphatic protest against the Ramapo Water Scheme is a matter of general knowledge. The spirit in which the investigation was undertaken is set forth in the first page of the report: "It is but just to yourself, in view of recent events, for me to record your earnest expression to me that you were not asking for evidence to be collected with a view to sustaining your personal views, but that what you wanted was a fair-minded determination of the truth by an engineer familiar with water supply and removed from local prejudices,—to get together as much reliable information on New York's need for more water as is possible in the time available, and present it without reserve."

A proper appreciation of the report can be realized only by keeping in mind the fact that the "oral request of Aug. 24, 1899," was followed by this very complete report by Mr. Freeman on March 23, 1900. The report takes up, first, the capacity and adequacy of the existing supply with reference to the present and immediate future; second, the question of waste prevention; third, the sufficiency of present supply for fire protection; fourth, available sources for additional supply; fifth, a discussion of the proposed Ramapo supply.

The report states in relation to certain of the investigations: "A careful recomputation has been made of the actual run-off of the Croton River day by day for the past thirty-two years, applying more accurate data to computing the flow from the old records of depth; whereby it plainly appears that the computations heretofore relied upon gave too large a flow by about 10 per cent."

"An investigation by experiments on full-size models of the Croton dam crests proves that the formula used heretofore for computing the water wasted exaggerated this flow about 9 per cent."

"A gauging of the flow of the new aqueduct made (at my request) by the same assistant engineer, with the same current meter by which the new aqueduct was originally gauged, proves that this has suffered an impairment of about forty million gallons per day in carrying capacity, due probably to its not being kept clean."

"The corrected results of the Croton River gaugings, covering this period of thirty-two years, and of the Croton Watershed rainfall records, have been condensed into tables and diagrams of great value for estimating the safe yield of such other watersheds as may be selected for new sources of supply."

"The present rate of consumption of Croton water, in gallons per day, has been accurately measured, with the result of showing that the estimates of consumption and of growth in consumption of water made by the Department of Water Supply at the time the Ramapo contract was urged were about forty million gallons per day too large."

"A very full geological study of the deep subterranean strata of Long Island and of Staten Island has been made with a view to learning of the possibility of a supply from deep wells, and of the best means of obtaining water from the saturated gravel. This, as already stated, shows that a deep artesian well supply, adequate for any general public supply, is practically hopeless."

The recomputation of the quantity wasted over the dam involved the abandonment of the formula previously used, but which was not adapted to the existing form of dam. Further than this, it was found that the length of dam was more than ten feet less than that formerly used for all depths above eight inches; that the depth previously used was incorrect, both because the dam crest is no longer level and in view of the further fact that the actual readings were all in error by .30 feet, and, in addition to this, only half of the readings taken were previously used. The result showed a total error of 9 per cent. in the flow. Freeman did not depend on old formulas, however; for he was not content until his results were corroborated by careful laboratory experiments on full-sized models duplicating the form of the dam. The determination of the flow of the old Croton aqueduct involved the critical examination of various records of old gaugings, dating back more than thirty years, the making of a series of new gaugings, an examination as to the difference in coefficients for clean and for foul walls of conduit, a comparison of coefficients found correct in the new Croton aqueduct and in the Sudbury conduit, the Wachusett aqueduct and the

Dorchester Bay Tunnel. It was also found that there had been loose methods of gauging in use; and Mr. Freeman's estimate of an error of fourteen million gallons in twenty-four hours, or 15 per cent., he considers conservative.

With the recomputations made of the records from 1868 to 1899, Freeman believes that the error in the estimate of the "mean flow for a month or a year is less than the ordinary error of measurements of a water supply by plunger displacement." With reference to its bearing upon the yield of the Croton and other drainage areas, the rain gaugings were overhauled, and the comparative weight determined of those taken at four different parts of the area, this being necessary, since some of the gauges were set in unsuitable proximity to trees, and at some of the earlier dates the readings were not entitled to full credit. These recomputations also were from 1868.

The study of the question of waste prevention involved measurements of the consumption of water at various hours of the day and night, showing for a minimum at 2 to 4 A.M. a rate of as much as ninety-six gallons per day, while the maximum reached only forty-three gallons more than this. In addition to this, experiments were made in Fall River and Woonsocket for comparison, these cities being very fully furnished with meters. The sources of leakage are investigated in detail and very thoroughly, as also the effect of the use of meters and of special systems of waste detection, for the purpose of doing away with undue waste. The results enable him to estimate the probable demand per head of population for a series of years, both under existing and improved conditions; while a further study of the probable increase in population became necessary, to reach the total supply needed for the future.

The problem of storage was studied by the modern method of "Mass Curve," which is readily made to show the depletion of the reservoir at any time and under any assumption as to draft. While this involved much labor in preparation, the curves, when drawn, allow very simple means of studying problems of storage and depletion. Mr. Freeman finds that with the completion, in 1902, of the new Croton dam (now under construction, with C. S. Gowan,

'71, in charge), the economical storage limit of the Croton basin will then have been reached; while as early a date as 1905 will mark the ultimate safe limit of the present supply.

The general question of water pressure and fire protection is thoroughly within the limits of Freeman's special experience, so that it required little effort for him to comply with the requirements in this direction. Under the heading of "Basis of Estimating Costs" were investigated the determination of section of aqueduct, the costs for "cut and cover" construction, for tunnels lined wholly or in part only, and also for large steel conduit construction, requiring a consideration of carrying capacity as well as type of construction as to rivets and the like. Interest, depreciation, taxes, and sinking fund formed items for study, as also cost of maintenance of conduits.

Then follows the consideration of the various possible sources of supply, twelve in number, for six of which estimates were made in considerable detail. For the supply favored by the report the investigation was fairly complete, and included the design of section of dam and its location, both with a reasonably close approximation, actual contour surveys being specially made at the proposed dam site. Among the items are a relocation of a railroad for twenty miles and the making good, in some way, about ninety miles of highways, the building of a distributing reservoir, and computing the damage in the case of various water powers. Of course, the storage reservoir and the conduit furnish occasion for detailed estimates. In this supply, the Ten Mile River and Upper Housatonic supplies (combined), the drainage area is in excess of one thousand square miles.

Considerable attention is also given to the project of taking a supply of filtered water from the Hudson above Poughkeepsie, with provision for augmenting the supply from the Adirondacks,—a scheme which has altogether met with considerable favor by other investigators, and whose merits are here recognized. The Ten Mile River and Upper Housatonic scheme he favors, subject to arrangements being made through the Connecticut legislature for granting rights or possibly setting off most of the territory necessary to be

acquired or controlled. For this scheme his estimate is that a supply of seven hundred and fifty to eight hundred million gallons per day will cost about \$10 per million gallons.

Mr. Freeman takes up the Esopus Creek Supply (the Ramapo scheme), which provides for the inefficient amount of two hundred million gallons, and shows that it would cost, including sinking fund, less than \$30 per million gallons, or less than half the amount provided for in the contract of the Ramapo Company, which, however, did not provide for the acquirement of the works. The actual cost without sinking-fund provisions would be about \$20 against the proposed contract price of \$70, this on even terms. The Hudson River supply from Poughkeepsie, including filter basins and storage basins in the Adirondacks, would yield eight hundred million at a cost of \$50 per million, including sinking fund, or much less than the Ramapo contract.

Mr. Freeman was fortunate in having regularly as assistants Messrs. M. Knowles, '91, G. A. Taber, '94, E. D. Pingree, '96; and among those whom he thought it proper to mention, in view of valuable assistance rendered him, are found C. S. Gowan, '71, and J. Waldo Smith, '87, while Professor Crosby was responsible for the geological reports.

That Mr. Freeman should have been able to present so able and so comprehensive a report in the limited time at his disposal is doubly an occasion for surprise and commendation, in view of the fact that his position as president and treasurer of three insurance companies had apparently put him outside of direct engineering activity. His capacity for handling this work (in addition to his business duties with his companies), in considerable part through assistants, stamps him as possessing the ability to ably direct the work of others,—an ability of a higher order even, in the estimation of many, than that shown in the individual work which secured for him, on two separate occasions, the Norman Gold Medal of the American Society of Civil Engineers.

A CENTURY OF SCIENCE AND OTHER ESSAYS

BY JOHN FISKE. Boston, Houghton, Mifflin & Co., 1900.

In "A Century of Science and Other Essays" John Fiske has brought together fourteen magazine articles and public addresses, chiefly of the last ten years. They range in scope from the progress of pure science in one hundred and twenty-five years to a discussion of such "eccentric literature" as attempts to square the circle. The larger number deal with historical and literary subjects, and all are written in Mr. Fiske's usual lucid, instructive, and interesting manner. The biographical sketches of Edward L. Youmans, Francis Parkman, and Edward A. Freeman are worth specially noting.

A DIVIDEND TO LABOR: A STUDY OF EMPLOYERS' WELFARE
INSTITUTIONS

BY NICHOLAS PAINE GILMAN. Boston, Houghton, Mifflin & Co., 1899.

This volume is principally devoted to a consideration of employments in which the laborer gets the benefit of something more than mere wages, but not to the extent of direct profit-sharing. Germany, France, Holland, Belgium, England, and the United States are passed in review. As samples of some of the ways in which employers voluntarily seek to better the material and intellectual conditions of their workmen may be cited the practice of the Krupp Works in Germany of loaning money at low rates for building houses, setting up stores at which goods are sold at only a slight advance above cost, establishing hospitals and schools, aiding in life insurance and in other similar ways. In our own country we find employers assisting in savings and building undertakings, providing lodgings and board at cost or less, furnishing libraries, gymnasiums, and recreation grounds, and so on. The last one hundred pages of the book treat of profit-sharing itself, and this part is practically a supplement to the author's book on profit-sharing published some years ago.

POLYPHASE ELECTRIC CURRENTS AND ALTERNATE CURRENT
MOTORS

By SILVANUS P. THOMPSON. Spon & Chamberlain, New York.

The second edition of this work, with the addition of twenty-four colored diagrams and other improvements, is without any doubt the best general text-book in the English language to-day for the use either of the instructor or of the classes in electrical engineering in any institution in the country.

The chapters on the construction of both generators and motors are so fully illustrated with reproductions from photographs that one hardly needs either lantern slides or drawings.

The diagrams of polyphase armature windings, with the different phases indicated by the use of (for example) red, green, and black lines, render it very much easier to see clearly the proper relations between the poles and the coils at any one time.

Chapter XIV., devoted to the considerations of polyphase static and rotary transformers, contains a very great amount of information; yet it must be confessed that it is not satisfactory and not up to date in this important particular. There is no treatment of the so-called "pumping" of rotaries and the methods for preventing it, nothing of the over-compounding and parallel running in sub-stations, nothing of the use on a three-wire system with the neutral passing by, etc.

W. L. P.